Liebert® PDX™ and Liebert PCW™ Thermal Management Systems

User Manual—17-29kW, 5-8 Tons, Upflow and Downflow, 60Hz

EMERSON
Network Power

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Liebert PDX and Liebert PCW. Read this manual thoroughly before attempting to install or operate this unit.

Only qualified personnel should move, install or service this equipment.

Adhere to all warnings, cautions and installation, operating and safety instructions on the unit and in this manual. Follow all operating and user instructions.

⚠ WARNING

Arc flash and electric shock hazard. Can cause injury and death.

Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure.

Open all local and remote electric power disconnect switches and verify with a voltmeter that power is Off before working within the various component electric connection enclosures.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

The Liebert iCOM® microprocessor does not isolate power from the unit, even in the Unit Off mode.

Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

The Liebert iCOM microprocessor does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of Liebert iCOM control.

The factory-supplied optional disconnect switch is inside the unit. The line side of this switch contains live high-voltage.

The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

Follow all local codes.

⚠ WARNING

Risk of explosive discharge from high-pressure refrigerant. Can cause injury or death.

This unit contains fluids and/or gases under high pressure. Relieve pressure before working with piping.

⚠ WARNING

Risk of refrigerant system rupture or explosion from overpressurization. Can cause equipment damage, injury or death.

Do not exceed the design pressure rating marked on the unit nameplate. This unit contains fluids and gases under high pressure. Relieve pressure before working with piping.

Local building or plumbing codes may require installing a fusible plug or other type of pressure relief device in the system.

WARNING

Risk of contact with high-speed rotating fan blades. Can cause injury or death.

Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and verify that all fans have stopped rotating before working within the unit cabinet.

Do not operate unit with any or all cabinet panels removed. Do not operate upflow units without installing a plenum, ductwork or guard over the blower opening(s) on the top surface of the unit cabinet.

Ductwork must be connected to the blower(s), or a plenum must be installed on the blower deck for protection from rotating blower wheel(s) on upflow units.

WARNING

Risk of improper handling of top heavy unit. Can cause unit to fall over, resulting in equipment damage, serious injury or death.

Read all instructions before attempting to move, lift, remove packaging from or preparing unit for installation.

CAUTION

Risk of contact with hot surfaces. Can cause injury.

The compressors, refrigerant discharge lines, humidifiers and reheats are extremely hot during unit operation. Allow sufficient time for them to cool before working within the unit cabinet. Use extreme caution and wear protective gloves and arm protection when working on or near hot compressors, discharge lines, humidifiers and reheats.

CAUTION

Risk of contact with sharp edges, splinters and exposed fasteners. Can cause injury.

Only properly trained and qualified personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move the unit, lift it, remove packaging from or prepare the unit for installation.

CAUTION

Risk of handling heavy and lengthy parts. Can cause personal injury and equipment damage.

Cabinet panels can exceed 5ft. (1.5m) in length and weigh more than 35 lb. (15.9kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate safety headgear, gloves and shoes should attempt to remove or install cabinet panels.

NOTE

The Liebert indoor cooling unit has a factory-installed high-pressure safety switch in the high side refrigerant circuit. A pressure relief valve is provided with Liebert Lee-Temp™ condensers.

NOTICE

Risk of clogged or leaking drain lines. Can cause equipment and building damage.

This unit requires a water drain connection. Drain lines must be inspected regularly and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks. This unit may also require an external water supply to operate.

Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment.

Do not locate unit directly above any equipment that could sustain water damage.

Emerson recommends installing a monitored fluid detection system to immediately discover and report coolant fluid system and condensate drain line leaks.

NOTICE

Risk of a leaking coolant fluid system due to freezing and/or corrosion can cause equipment and very expensive building damage.

Cooling coils, heat exchangers and piping systems that are connected to open cooling towers or other open water/glycol systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil, piping and heat exchanger corrosion. The water or water/glycol solution must be analyzed by a competent local water treatment specialist before startup to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program.

Read and follow individual unit installation instructions for precautions regarding fluid system design, material selection and use of field-provided devices. Liebert systems contain iron and copper alloys that require appropriate corrosion protection. It is important to have the system running with flow through exchangers maintained at initial system fill for 24 to 48 hours depending on size and system configuration.

Water chemistry varies greatly by location, as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components. The chemistry of the water used must be considered, because water from some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The water/coolant fluid must be treated and circulating through the system continuously to prevent the buildup of sediment deposits and or growth of sulfate reducing bacteria.

Proper inhibitor maintenance must be performed in order to prevent corrosion of the system. Consult glycol manufacturer for testing and maintenance of inhibitors.

Commercial ethylene glycol, when pure, is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the water from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

NOTICE

Risk of no-flow condition. Can cause equipment damage.

Do not leave the unit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched On and system pump operating continuously.

NOTICE

Risk of damage from forklift. Can cause unit damage.

Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

NOTICE

Risk of improper storage. Can cause unit damage.

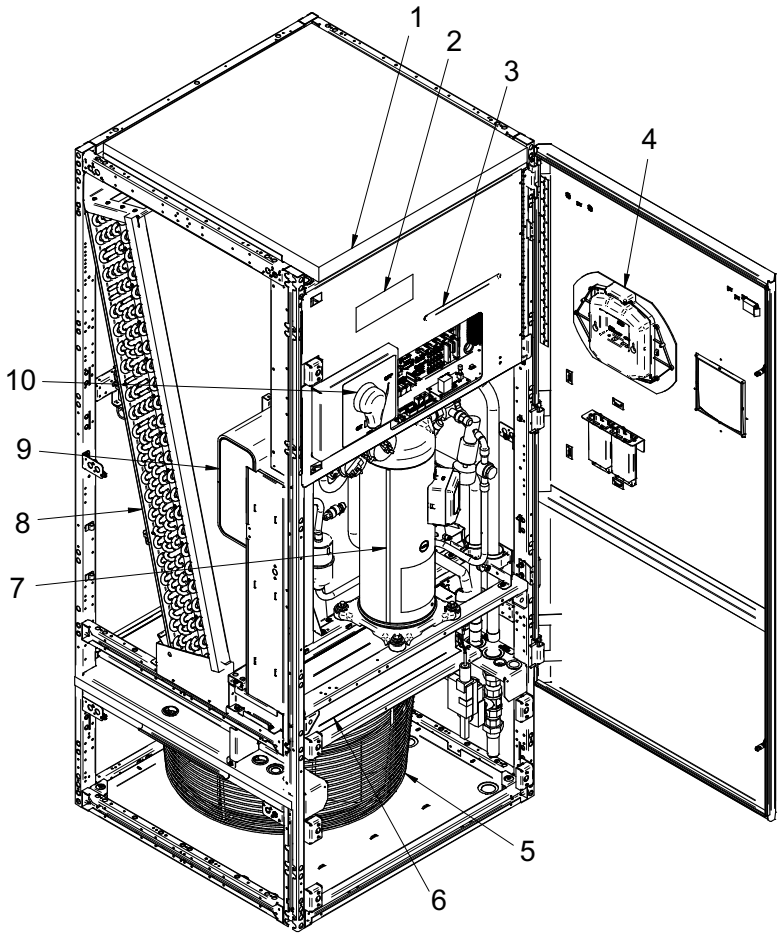
Keep the Liebert PDX and Liebert PCW upright, indoors and protected from dampness, freezing temperatures and contact damage.

Agency Listed

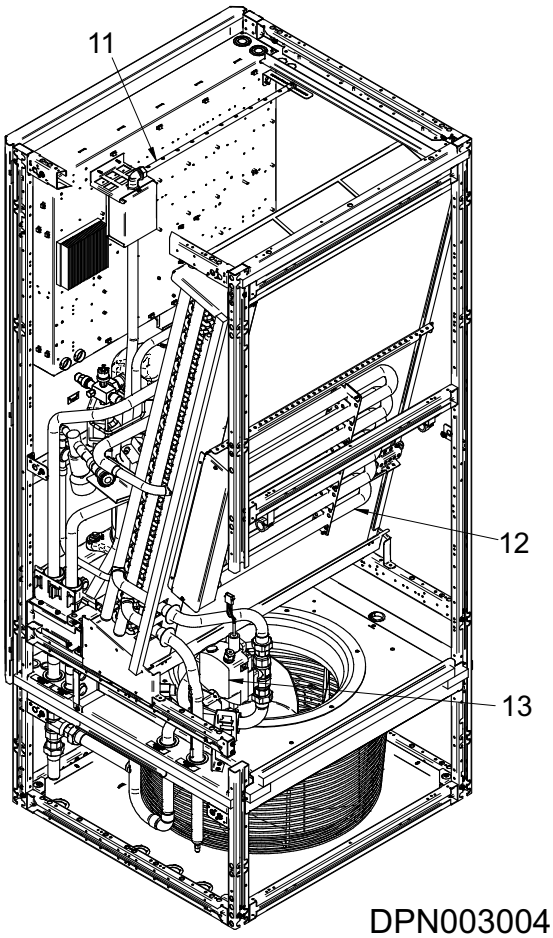
Standard 60Hz units are CSA certified to the harmonized U.S. and Canadian product safety standard CSA C22.2 No 236/UL 1995 for *Heating and Cooling Equipment* and are marked with the CSA c-us logo.

1.0 LIEBERT PDX AND LIEBERT PCW COMPONENTS AND NOMENCLATURE

Figure 1 Component locations—Downflow, Liebert PDX



Front View



Rear View

1. Filter
2. Serial Tag
3. Electric Box
4. Liebert iCOM
5. EC Fan
6. Infrared Humidifier, optional
7. Compressor
8. Evaporator Coil
9. Plate Condenser, optional
10. Disconnect
11. Smoke Detector, optional
12. Reheat, optional
13. Econ-O-Coil Valve - GLYCOOL/Dual Cooling, optional

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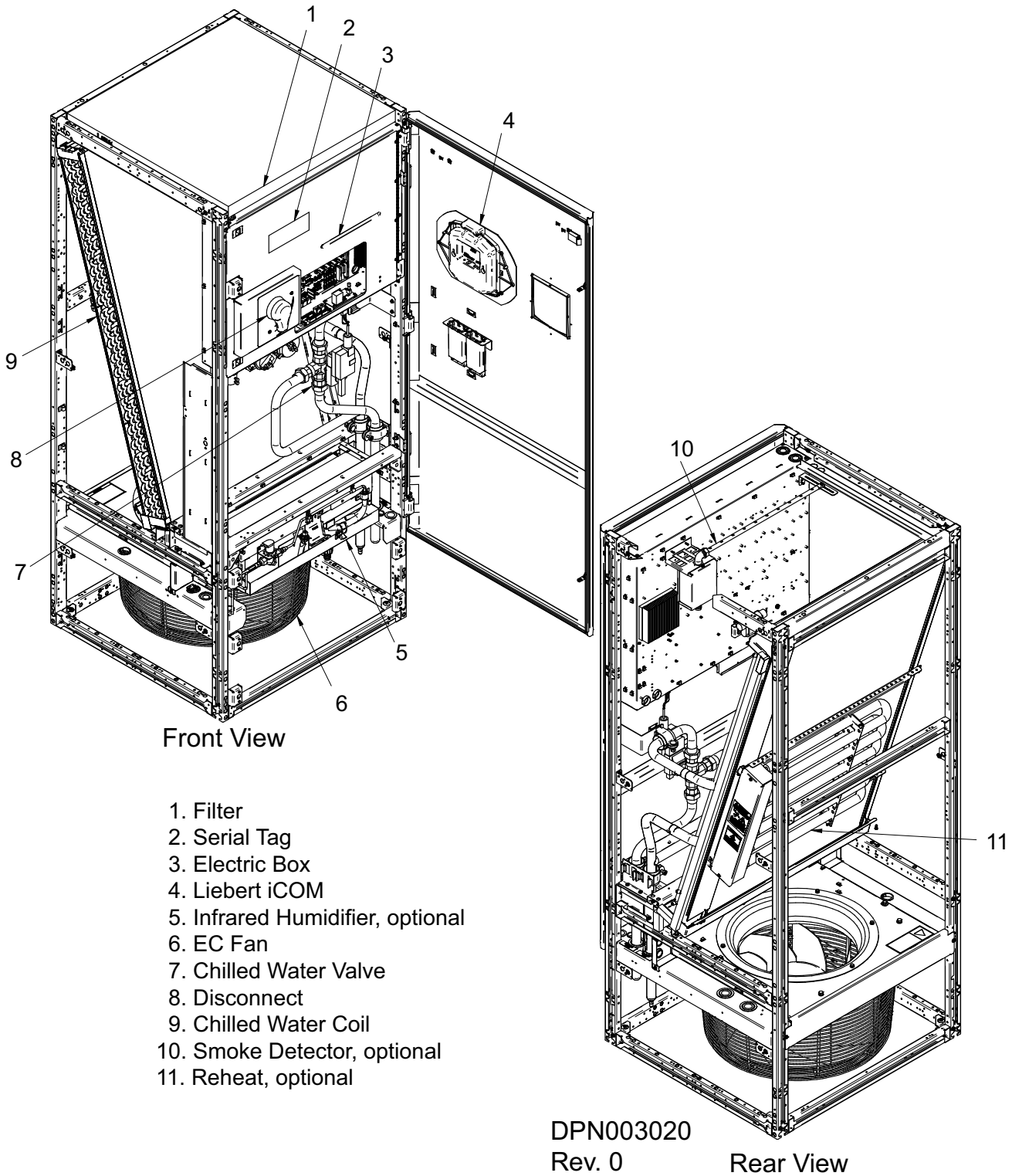
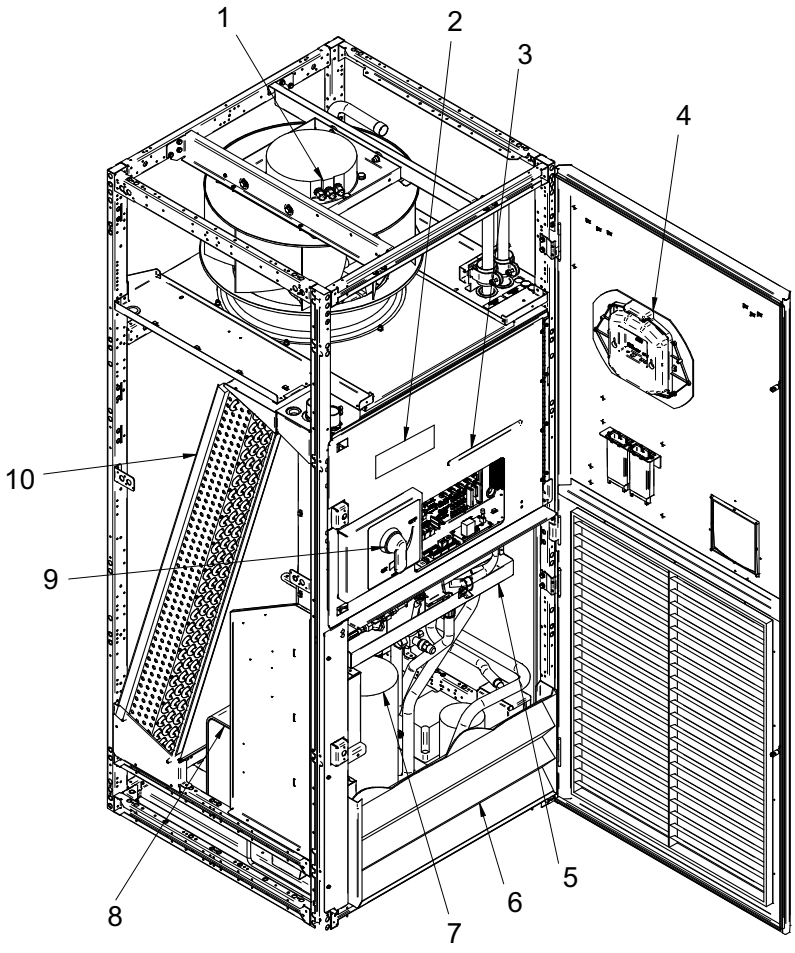
Figure 2 Component locations—Downflow, Liebert PCW

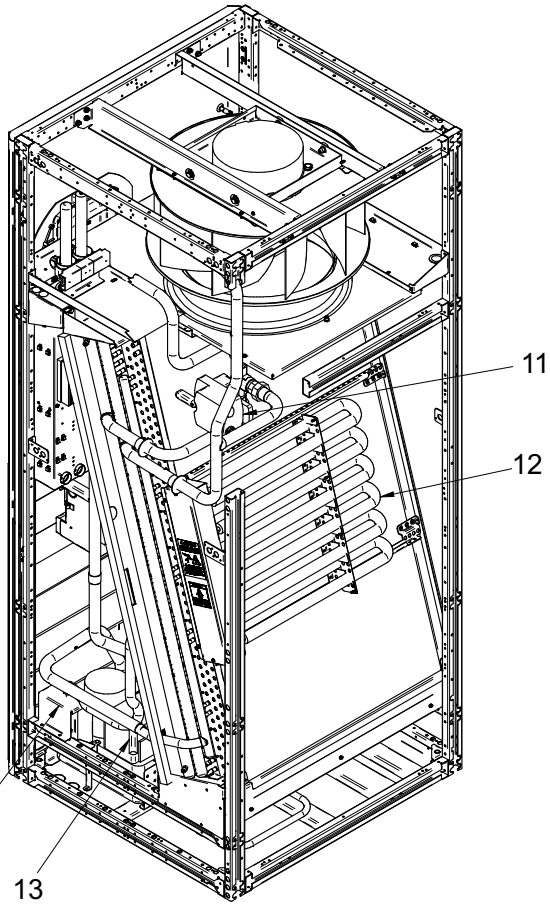


1. Filter
2. Serial Tag
3. Electric Box
4. Liebert iCOM
5. Infrared Humidifier, optional
6. EC Fan
7. Chilled Water Valve
8. Disconnect
9. Chilled Water Coil
10. Smoke Detector, optional
11. Reheat, optional

Figure 3 Component locations—Upflow, Liebert PDX



Front View



Rear View

1. EC Fan
2. Serial Tag
3. Electric Box
4. Liebert iCOM
5. Infrared Humidifier, optional
6. Filter, partial filter shown for clarity
7. Compressor
8. Plate Condenser, optional
9. Disconnect
10. Evaporator Coil
11. Econ-O-Coil Valve - GLYCOOL/Dual Cooling, optional
12. Reheat, optional
13. Condensate Pump, optional
14. Smoke Detector, optional

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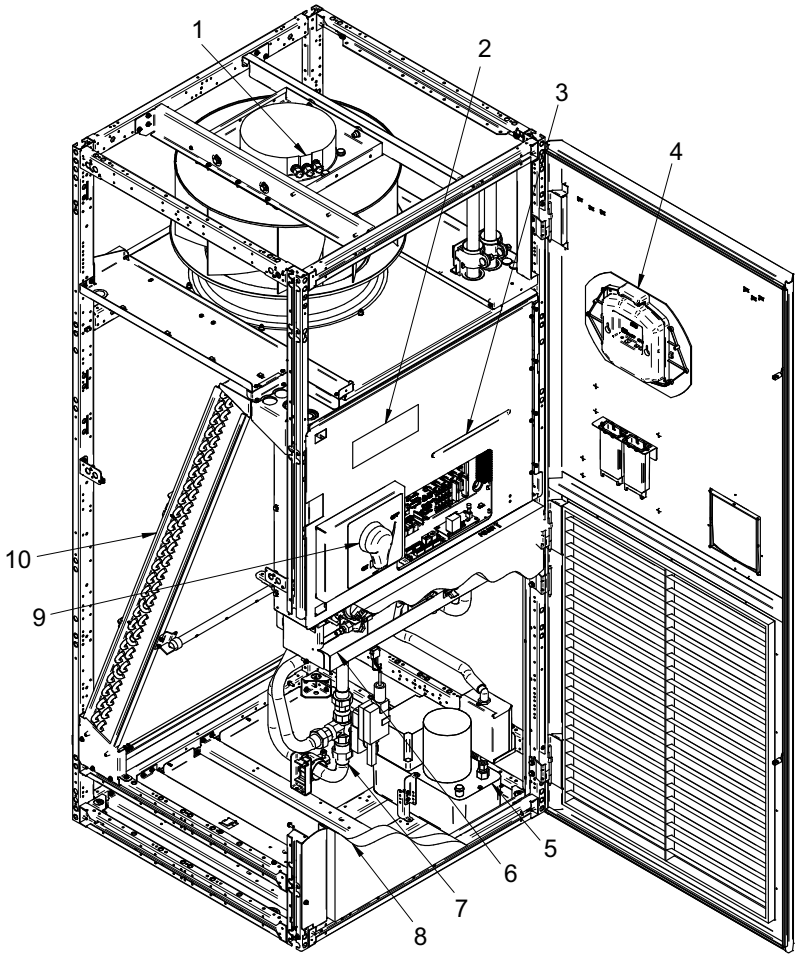
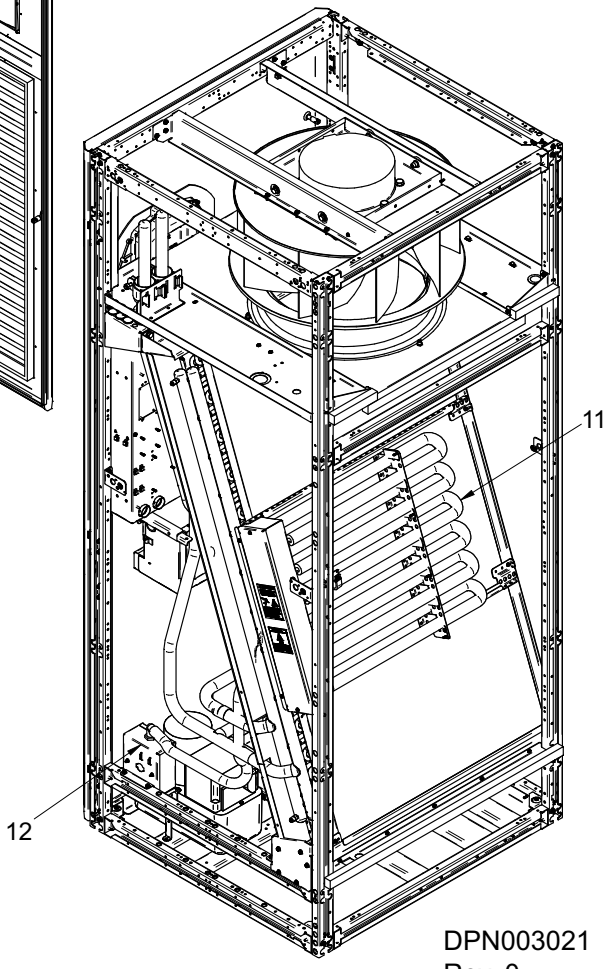
Figure 4 Component locations—Upflow, Liebert PCW



FRONT VIEW



REAR VIEW

1. EC Fan
2. Serial Tag
3. Electric Box
4. Liebert iCOM®
5. Condensate Pump, optional
6. Infrared Humidifier, optional
7. Chilled Water Valve
8. Filter (partial filter shown for clarity)
9. Disconnect
10. Chilled Water Coil
11. Reheat, optional
12. Smoke Detector, optional

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Model Number – Part 1/2										Model Details											Part 2/2			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
P	X	0	2	9	U	A	1	A	D	H	E	2	8	0	1	P	L	5	F	P	A	1	2	3

Digit 1, 2 = Product Family
PX = Liebert PDX (DX)
PW = Liebert PCW (CW)
Digit 3, 4, 5 = Cooling Capacity, kW
Nominal Sensible Capacity, kW
Digit 6 = Air Discharge
U = Upflow with front air return
C = Upflow with bottom air return
D = Downflow - discharge into raised floor
H = Downflow with front air discharge
1 = Downflow with front and right side discharge
2 = Downflow with front and right and left side discharge
3 = Downflow with front and left side discharge
Digit 7 = System Type
A = Air-Cooled
W = Water/Glycol-Cooled
G = GLYCOOL
C = Chilled Water
D = Dual Cool (Air-Cooled + FC Coil - 3-Way FC Valve)
H = Dual Cool (Water/Glycol-Cooled + FC Coil - 3-Way FC Valve)
2 = Dual Cool (Air-Cooled + FC Coil - 2Way FC Valve)
3 = Dual Cool (Water/Glycol-Cooled + FC Coil - 2-Way FC Valve)
Digit 8 = Airflow (fan type)
1 = EC plug fans
Digit 9 = Power Supply
A = 460V / 3ph / 60Hz
B = 575V / 3ph / 60Hz
C = 208V / 3ph / 60Hz
D = 230V / 3ph / 60Hz
2 = 380 / 3ph / 60Hz
Digit 10 = Cooling System
S = Standard Scroll w/TXV (no sound jacket)
D = Digital Scroll w/TXV (no sound jacket)
P = Digital Scroll w/EEV (no sound jacket) [3]
8 - Digital Scroll with TXV & Sound Jacket
9 - Digital Scroll with EEV & Sound Jacket [3]
2 = Chilled Water - 2-Way Standard Pressure
3 = Chilled Water - 3-Way Standard Pressure
1 = Chilled Water - 2-Way High Pressure
T = Chilled Water - 3-Way High Pressure
Digit 11 = Humidification
0 = No humidifier
H = Infrared Humidifier
S = Steam Gen Canister Humidifier
Digit 12 = Display
E = Large Display w/ Supply Air Sensor
Digit 13 = Reheat
0 = No reheat
2 = Electric reheat (2-Stage)
4 = Hot Water Reheat (CW only)

Note: The 14-digit model number consists of the first 10 digits and last four digits of the configuration number.

Digit 14 = Air filter
8 = MERV 8, 2" (with Clogged Filter Sensor)
9 = MERV 11, 2" (with Clogged Filter Sensor)
Digit 15 Coil, Valve & Pressure Options
0 = Air-Cooled, no valve
1 = Standard Pressure, 2 Way MBV (condenser valve)
2 = High Pressure, 2 Way MBV (condenser valve) [1]
7 = Standard Pressure, 3 Way MBV (condenser valve)
8 = High Pressure, 3 Way MBV (condenser valve) [1]
B = Standard Pressure, Dual Cool (Air-cooled)
E = High Pressure, Dual Cool (Air-Cooled)
Digit 16 = Enclosure options
1 = No options
C = Double-skin panels
3 = IBC/OSHPD bracing [2]
8 = Double skin panels and IBC/OSHPD [2]
Digit 17 = High-Voltage Options
M = Locking Disconnect (65kA) No condensate pump
P = Locking Disconnect (65kA) with condensate pump
Digit 18 = Low-Voltage Option Packages
0 = None
L = Terminal Package
H = Reheat & Humidifier Lockout
R = Remote Humidity Contact
C = Term. Pkg. and R/H lockout
D = Term. Pkg. and remote humidifier contact
E = Term. Pkg. and R/H lockout and remote humidifier contact
F = Remote humidifier contact plus R/H lockout
Digit 19 = Monitoring Cards
0 = No Cards
U = One Liebert IntelliSlot™ IS-UNITY-DP Card
C = One Liebert IntelliSlot IS-485EXI
6 = One IS-Unity-DP and IS-485EXI
7 = Two Liebert IntelliSlot™ IS-UNITY-DP Cards
Digit 20 = Sensors
0 = None
S = Smoke Sensor
H = High-Temperature Sensor
F = Smoke and High-Temperature Sensors
C = Compressor Overload Sensor
A = Smoke and Compressor Overload Sensors
D = High-Temperature Compressor Overload Sensors
K = Smoke, High-Temperature Compressor Sensors
Digit 21 = Packaging
P = Domestic
C = Wood Crate Export
Digit 22 = Configuration code
A = No SFA's (An Alpha except S)
S = SFA
Digit 23-25 = Factory Configuration Number

1. High-pressure MBV also results in high pressure FC valve.
2. Consult Factory for IBC/OSPHD option availability.
3. Consult Factory for EEV option availability

2.0 PRE-INSTALLATION GUIDELINES

2.1 Room Preparation

- Verify that the floor is level, solid and sufficient to support the unit. See **Table 2** for unit weights.
- Confirm that the room is properly insulated and has a sealed vapor barrier.
- For proper humidity control, keep outside or fresh air to an absolute minimum (less than 5% of total air circulated in the room).
- Do not install a Liebert PDX and Liebert PCW in an alcove or at the end of a long, narrow room.
- Install the units as close as possible to the largest heat load.
- Allow at least the minimum recommended clearances for maintenance and service. See **Figures 5** through **22** for dimensions.
- Emerson recommends installing an under-floor water detection system. Contact your local Emerson representative for information.

2.2 Air Distribution—Downflow Units

- Verify that the raised floor has been properly sized for the unit's airflow and the room is free of airflow restrictions.
- Perforated floor tiles in the raised floor should ensure minimal pressure loss.
- The raised floor must provide 7-1/2" (191mm) of clearance.
- Ensure that there is adequate clearance above the unit for service, such as replacing filters.

2.3 Air Distribution—Upflow Units

For in-room applications with supply and return grilles, several feet of clearance must be maintained at the intake and discharge of the unit.

2.4 Connections and System Setup

- Plan the routing of wiring, piping and ductwork to the unit. See **Figures 16** through **34** for unit connection locations.
- Water/glycol and GLYCOOL units utilizing a drycooler may require an optional aquastat setting. See **Tables 21** and **22** for aquastat setting guidelines. Applications with the optional stat setting require field piping to be insulated to prevent condensation.
- The unit requires a drain, which must comply with all applicable codes. This drain line may contain boiling water. See **6.1.1 - Condensate Piping—Field-Installed** for details.
- Three-phase electrical service is required for all models. Electrical service must conform to national and local electrical codes. See equipment nameplate for details.
- If seismic requirements apply, consult your local Emerson representative for information about a seismic-rated floor stand.

NOTE

Seal openings around piping and electrical connection to prevent air leakage. Failure to do so could reduce the unit's cooling performance.

2.5 Operating Conditions

2.5.1 Cooling, Humidification and Dehumidification

The Liebert PDX and Liebert PCW must be operated in a conditioned space within the operating envelope ASHRAE recommends for data centers: Maximum dew point of 59°F (15°C).

Operating outside this envelope can decrease equipment reliability.

Return air to the Liebert PDX and Liebert PCW must be no cooler than the ASHRAE recommendation of 68°F (20°C) DB and 40% RH or minimum WB of 54°F (12.2°C) for proper unit operation. Operating below this can decrease equipment reliability.

Refer to ASHRAE's publication, "Thermal Guidelines for Data Processing Environments."

2.5.2 Heating

The Liebert PDX and Liebert PCW are qualified for heating-only operation at temperatures not exceeding 80°F (27°C).

3.0 LIEBERT PDX AND LIEBERT PCW DIMENSIONS AND WEIGHTS

Table 1 Shipping dimensions—Liebert PDX and Liebert PCW, domestic and export

Model Number	LxWxH, in. (mm)	
	Domestic	Export
PX018, PX023, PX029, PW017, PW029	45 x 45 x 85 (1143 x1143 x 2159)	45 x 45 x 86 (1143 x1143 x 2184)

Table 2 Shipping weights—approximate

Model #	Cooling Type	Domestic, lb. (kg)	Export, lb. (kg)
PX018 PX023	Air	780 (353.8)	884 (400.9)
	Air with Dual Cool	860 (390)	964 (437.2)
	W/G	800 (362.8)	904 (410)
	Water/Glycol with Dual Cool & GLYCOOL	880 (399.2)	984 (446.3)
PX029	Air	810 (367.4)	914 (414.6)
	Air with Dual Cool	900 (408.2)	1004 (455.4)
	W/G	830 (376.5)	934 (423.6)
	Water/Glycol with Dual Cool & GLYCOOL	920 (417.3)	1024 (464.5)
PW017 PW029	CW	710 (322.0)	814 (369.2)

Figure 5 Cabinet and floor planning dimensions—downflow

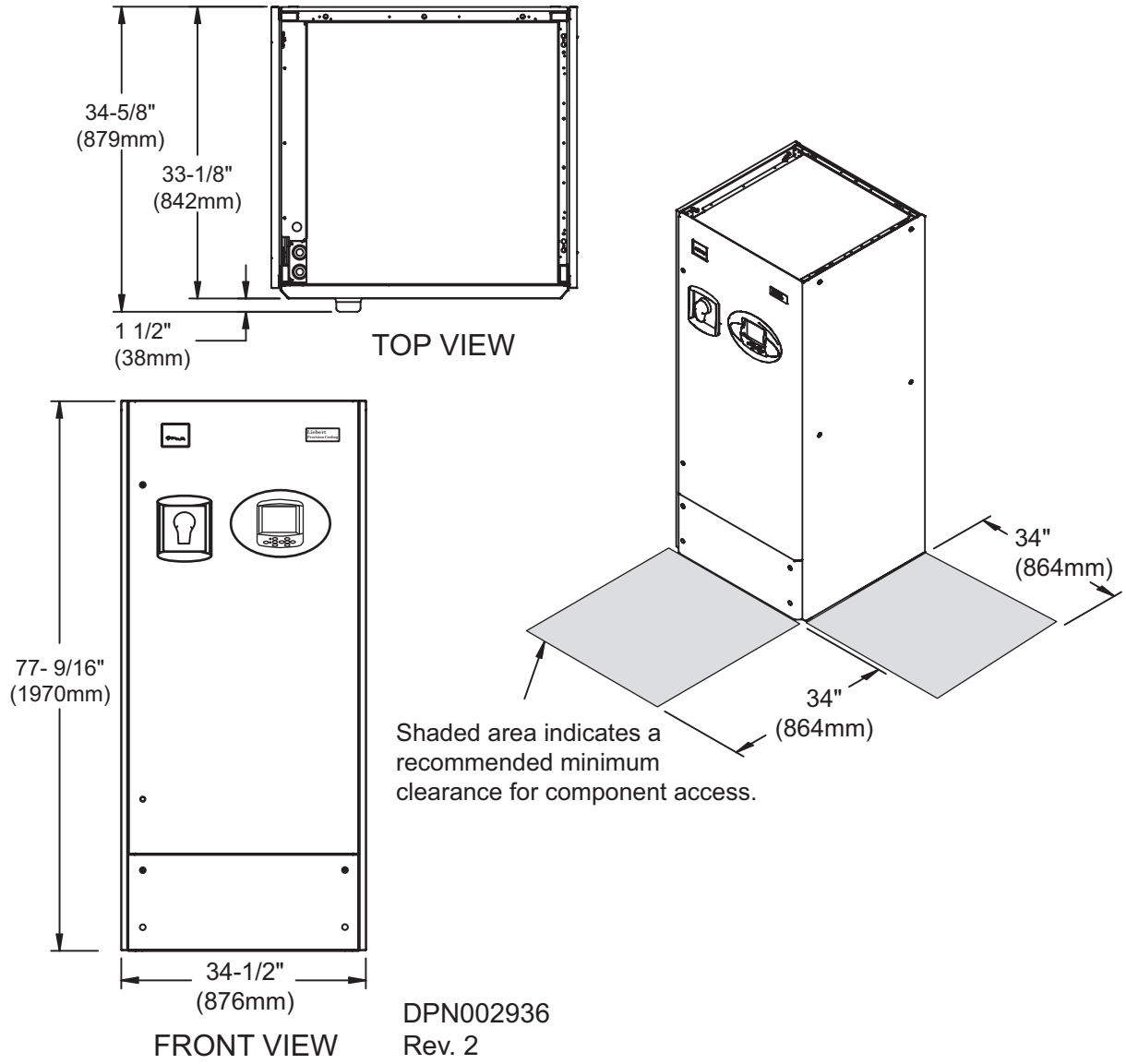
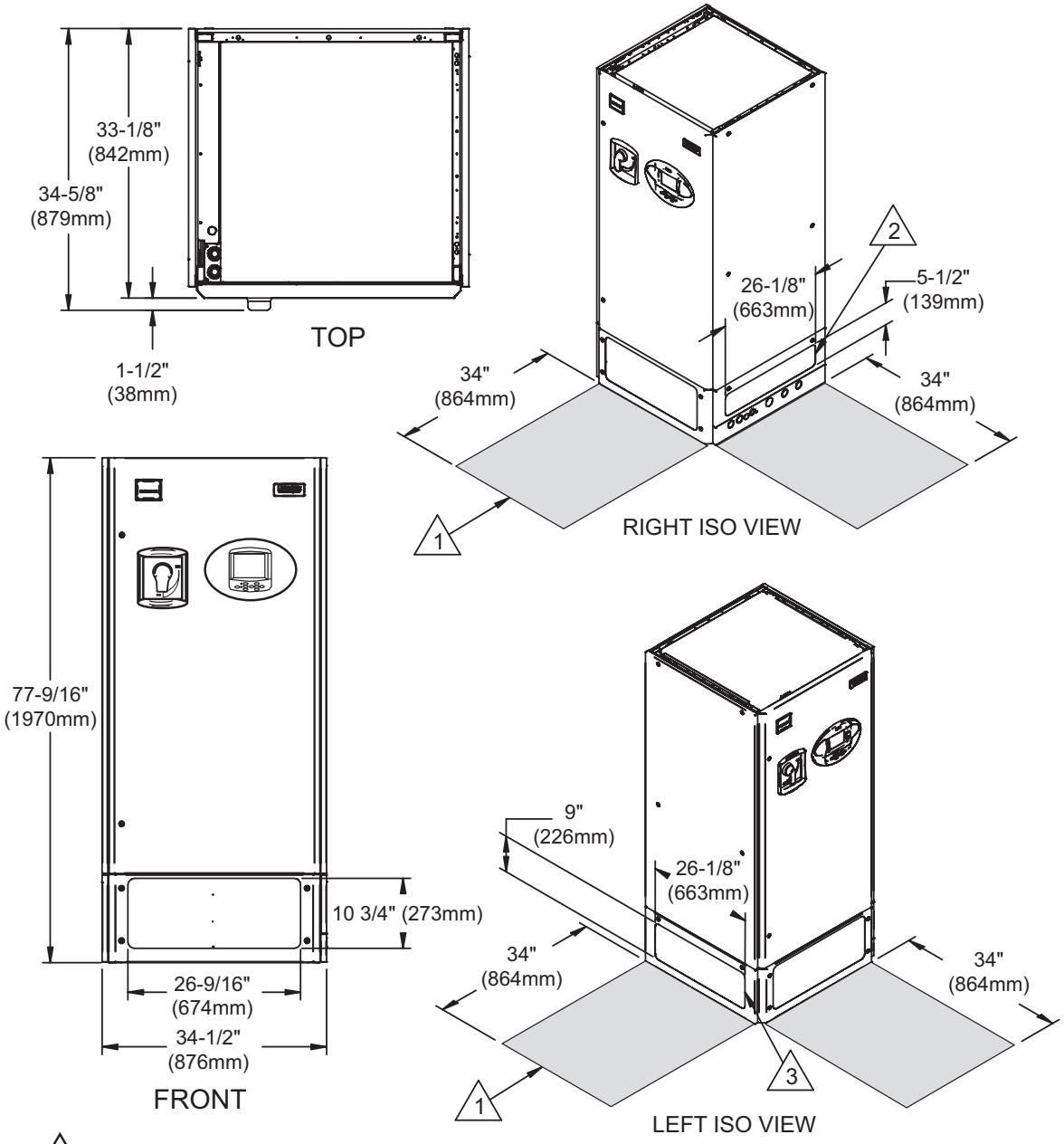


Table 3 Weights for downflow, Liebert PDX and Liebert PCW, lb. (kg)

Liebert PDX Model No.	**PX018-023**	**PX029**
Air Cooled	670 (304)	700 (317)
Air Cooled w/Dual Cool	750 (340)	790 (358)
Water/Glycol	690 (313)	720 (327)
GLYCOOL or Water/Glycol w/Dual Cool	770 (349)	810 (367)
Liebert PCW Model No.	**PW017-029**	
Chilled Water	600 (272)	

Source: DPN002936, Rev. 2

Figure 6 Cabinet and floor planning dimensions—front discharge, downflow



1 Shaded area indicates the recommended minimum clearance for component access.

2 Optional opening for units with right side discharge or right and left side discharge.

3 Optional opening for units with left side discharge or right and left side discharge

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Table 4 Weights for downflow, Liebert PDX and Liebert PCW, lb. (kg)

Liebert PDX Model No.	**PX018-023**	**PX029**
Air-Cooled	670 (304)	700 (317)
Air-Cooled w/Dual Cool	750 (340)	790 (358)
Water/Glycol	690 (313)	720 (327)
GLYCOOL or Water/Glycol w/Dual Cool	770 (349)	810 (367)
Liebert PCW Model No.	**PW017-029**	
Chilled Water	600 (272)	

Source: DPN002944, Rev. 0

Figure 7 Cabinet and floor planning dimensions—Upflow

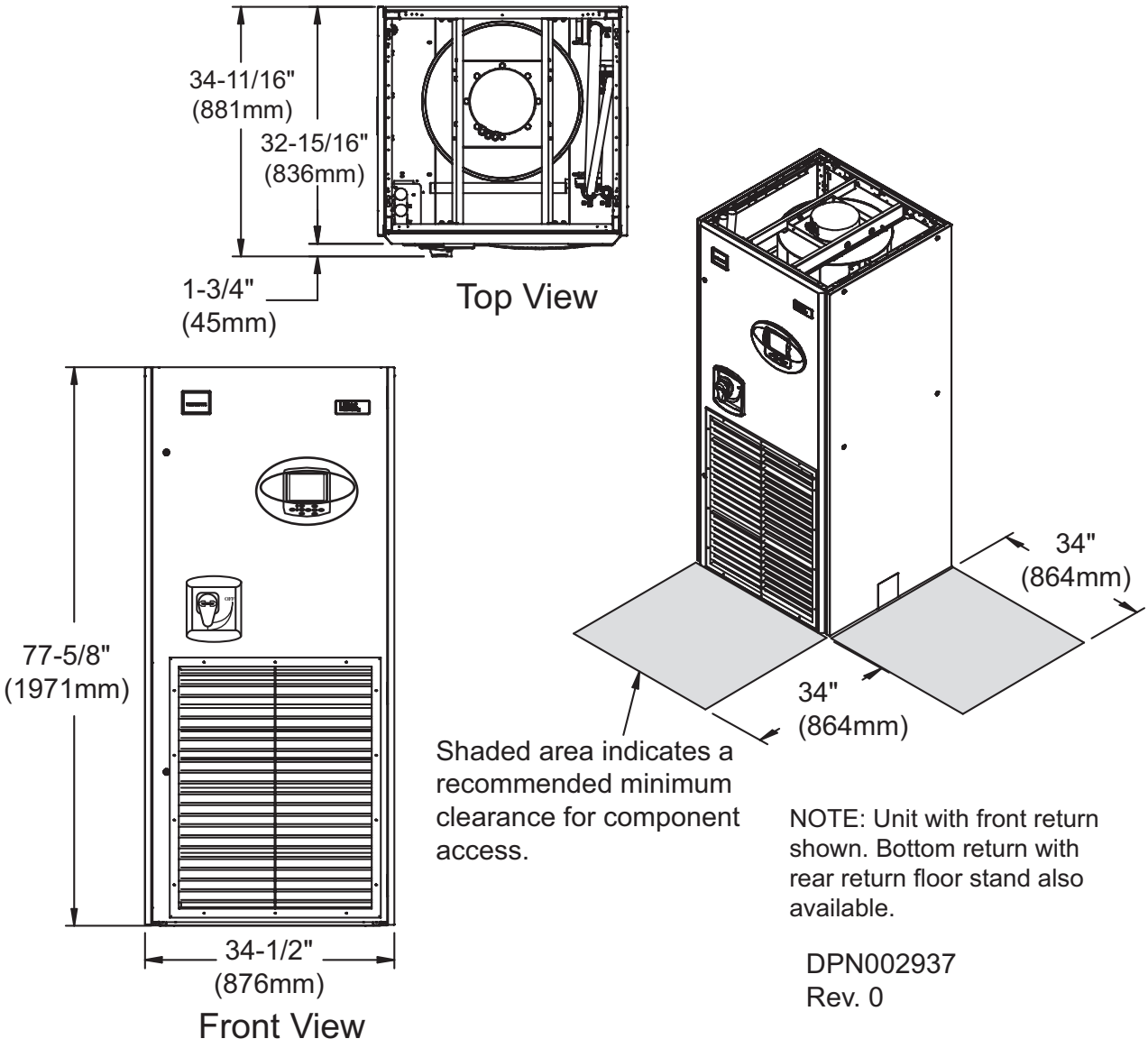


Table 5 Approximate weights, upflow models, lb. (kg)

Liebert PDX Model No.	**PX018-023**	**PX029**
Air-Cooled	670 (304)	700 (317)
Air-Cooled w/Dual Cool	750 (340)	790 (358)
Water/Glycol	690 (313)	720 (327)
GLYCOOL or Water/Glycol w/Dual Cool	770 (349)	810 (367)
Liebert PCW Model No.	**PW017-029**	
Chilled Water	600 (272)	

Source: DPN002937, Rev. 0

3.1 Floor Stand Dimensions

Figure 8 Floor stand dimensions—Downflow and upflow, front return floor stands

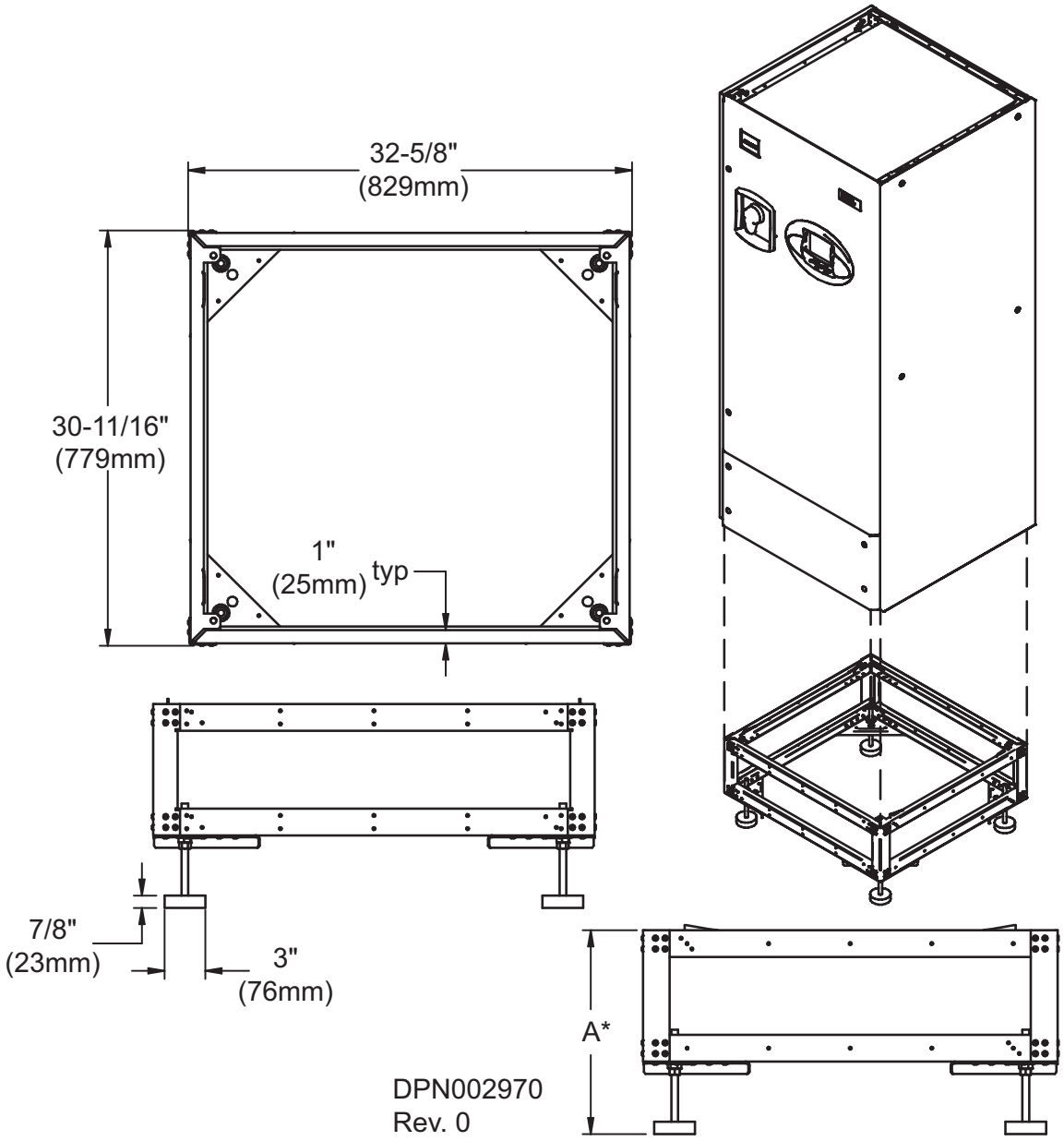
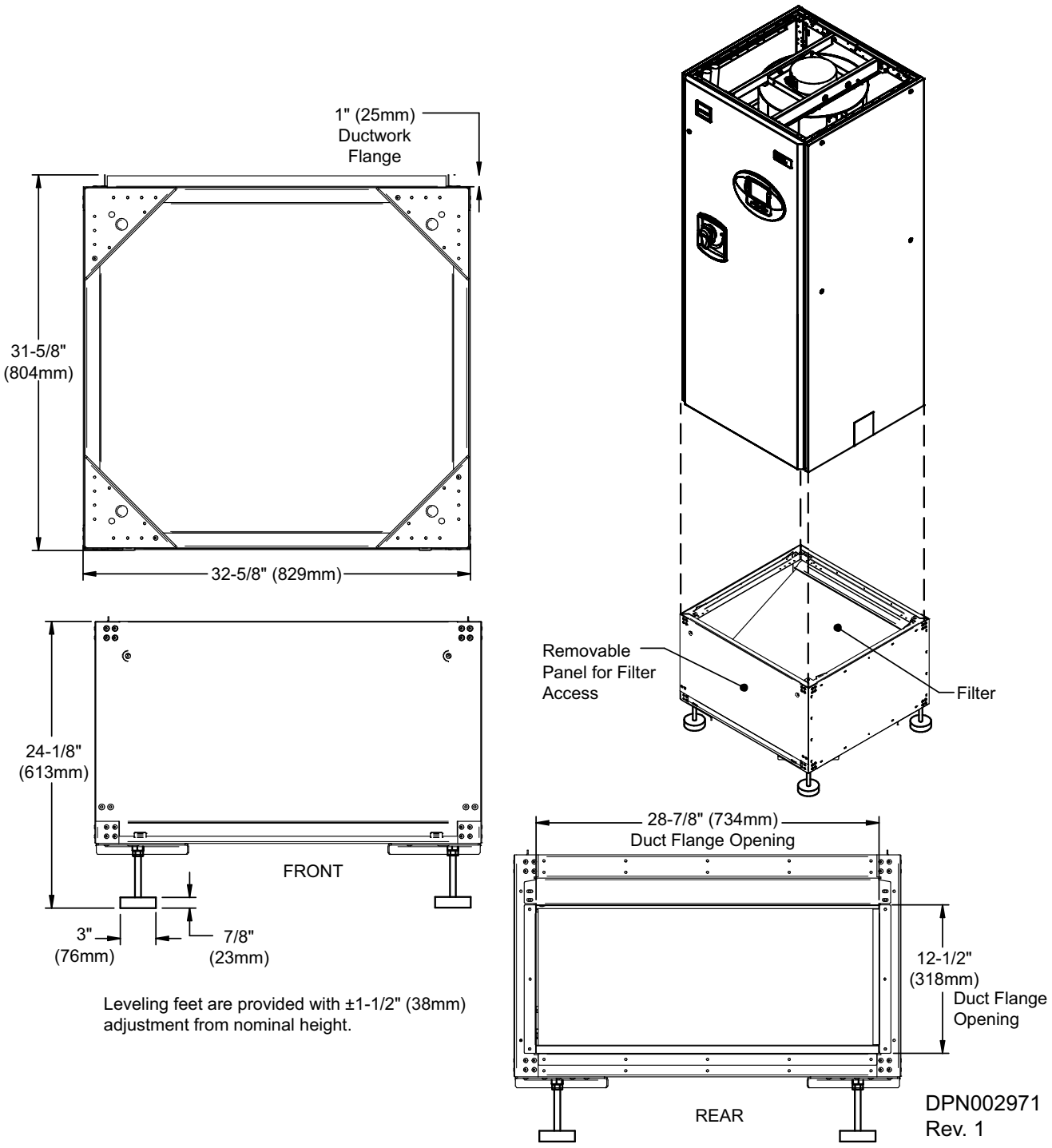


Table 6 Floor stand height—Downflow

A Height, in. (mm)
6 (152)
9 (229)
12 (305)
15 (381)
18 (457)
21 (533)
24 (610)

* Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height A.
Source: DPN002970, Rev. 0

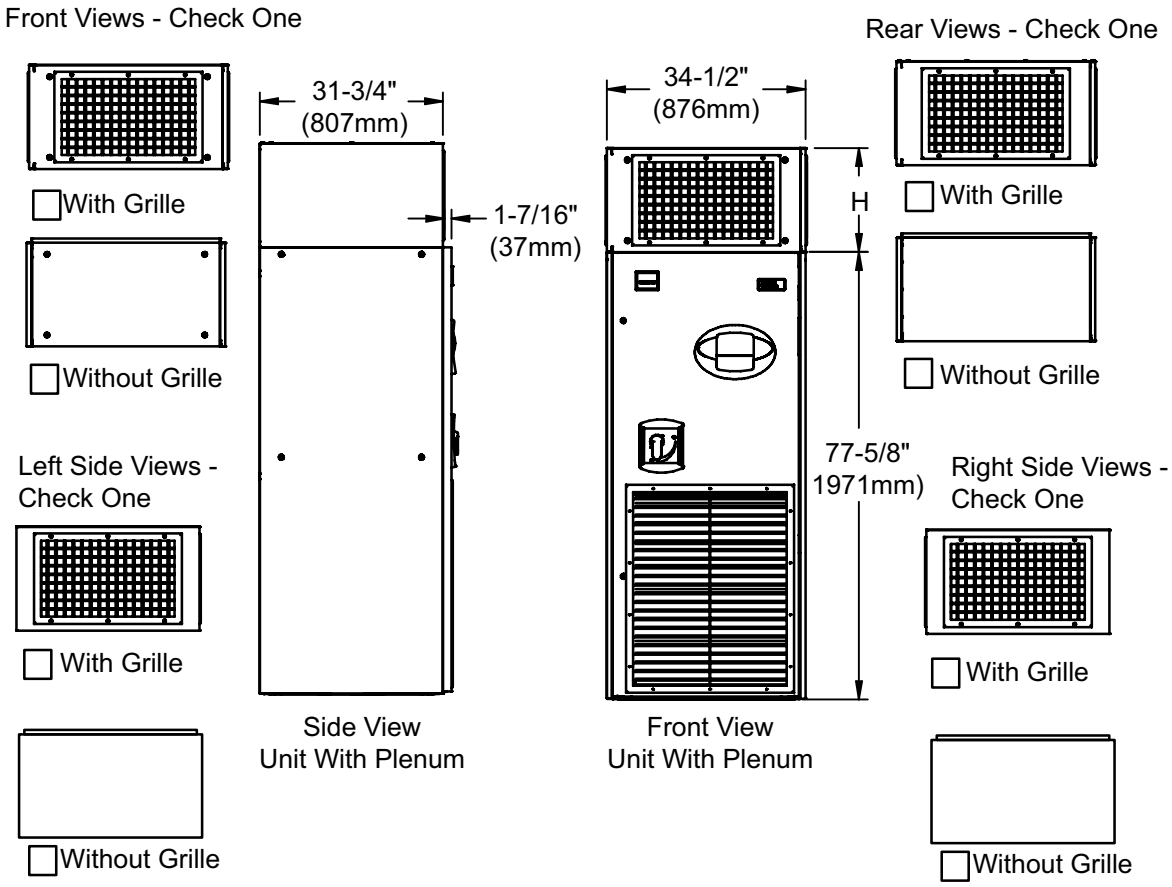
Figure 9 Floor stand dimensions—Upflow, rear return floor stands



Leveling feet are provided with ±1-1/2" (38mm) adjustment from nominal height.

3.2 Plenum Dimensions

Figure 10 Plenum dimensions—Upflow



Notes
1. Typical unit orientation shown with grille plenum. Plenum with grille is available only for 18" height plenum. Nominal grille size is 24" x 14" (609mm x 355mm).
2. All plenums are shipped flat and must be field-assembled.
3. Unit with front return shown. Bottom return with rear return floor stand also available.

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Table 7 Upflow unit plenum dimensions

H Height, in. (mm)
18" (457)
24" (609)
30" (762)
36" (914)
42" (1066)
48" (1219)

4.0 EQUIPMENT INSPECTION AND HANDLING

Upon arrival of the unit and before unpacking it, verify that the labeled equipment matches the bill of lading. Carefully inspect all items for damage, either visible or concealed. For initial access use a 7/32" Allen wrench for panel removal. Damage should be immediately reported to the carrier and a damage claim filed with a copy sent to Emerson Network Power or to your sales representative.

4.1 Packaging Material

All material used to package this unit is recyclable. Please save for future use or dispose of the material appropriately.

SAFETY INFORMATION

WARNING

Risk of top-heavy unit falling over. Can cause equipment damage, injury or death.

Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. Unit weights are specified in **Tables 3**, **4** and **5**.

CAUTION

Risk of sharp edges, splinters and exposed fasteners. Can cause personal injury.

Only properly trained personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move the unit, lift it, remove packaging or prepare the unit for installation.

NOTICE

Risk of doorway interference. The unit may be too large to fit through a doorway while on the skid. Measure the skid, unit and doorway and refer to the installation plans to verify clearances before moving the unit.

NOTICE

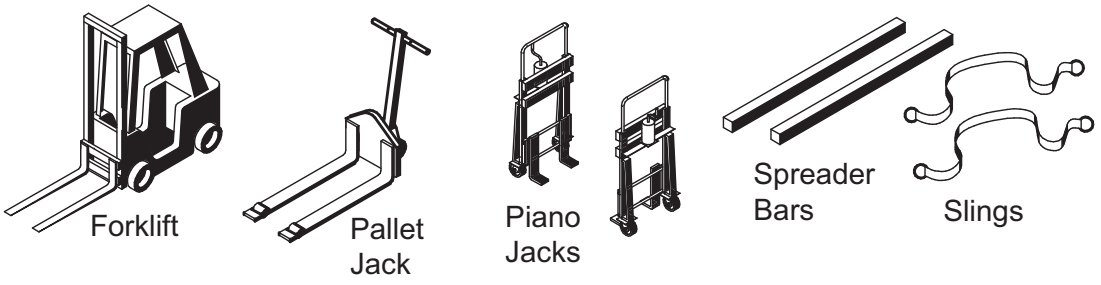
Risk of damage from forklift. Can cause unit damage.

Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

NOTICE

Risk of improper storage. Keep the Liebert PDX and Liebert PCW upright, indoors and protected from dampness, freezing temperatures and contact damage.

Figure 11 Equipment recommended for handling Liebert PDX and Liebert PCW



Transport the Liebert PDX and Liebert PCW with a forklift or pallet jacks whenever possible. If that is not possible, use a crane with belts or cables, slings and spreader bars.

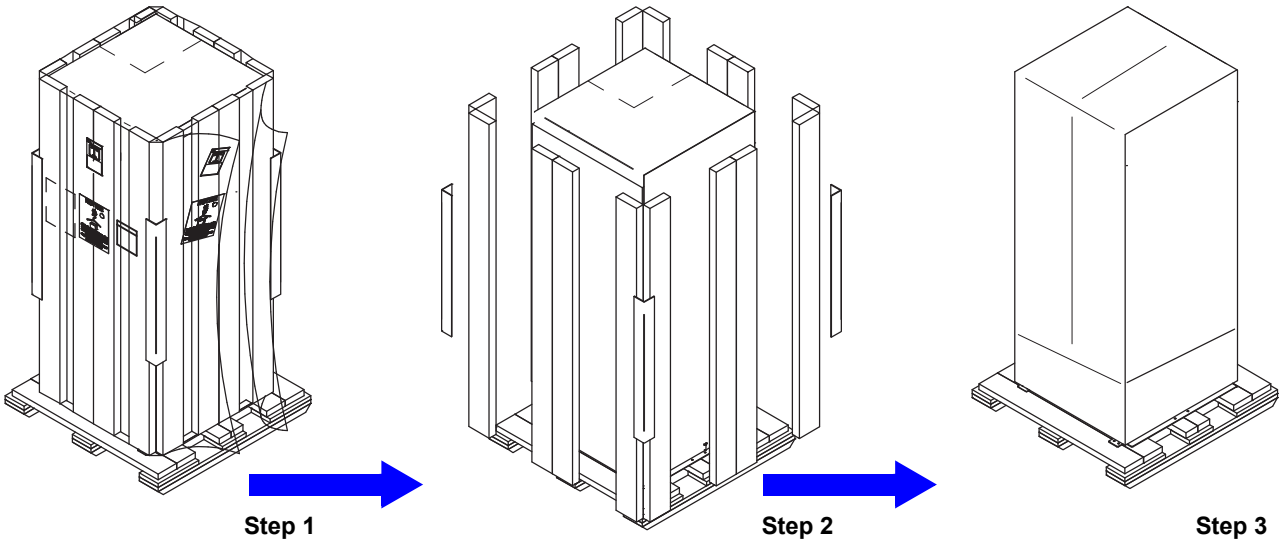
If using a forklift or pallet jack, make sure that the forks (if adjustable) are spread to the widest allowable distance that will fit under the skid.

4.2 Unpacking the Unit

Remove outer packaging when ready to install the unit.

1. Remove the exterior stretch wrap packaging material from around the unit, exposing the protective corner and side packaging planks.
2. Remove the corner and side packaging planks from the unit, exposing the bag over the unit.
3. Remove the bag from the unit when ready to remove the skid and install the unit.

Figure 12 Removing packaging



4.2.1 Removing the Unit from the Skid With a Forklift

WARNING

Risk of improper moving. Can cause equipment damage, injury or death.

Ensure that the tines are level, not angled up or down.

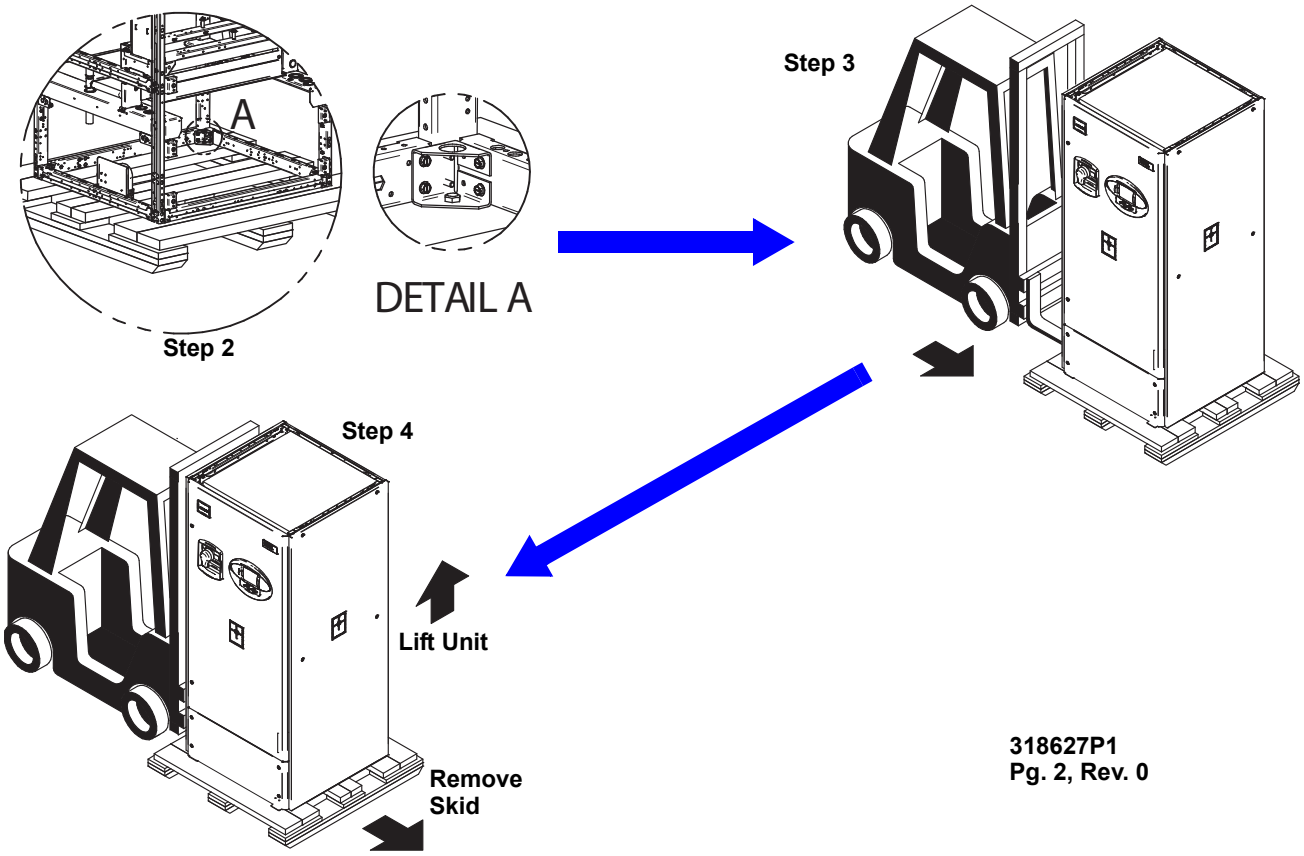
The tines must be at a height that will allow proper clearance under the unit.

Ensure that the tines extend beyond the opposite side of the unit.

The forklift tines must be equally spaced on either side of the center of gravity indicator (see **Figure 14**). Improper spacing or placement of the tines may cause the unit to tip and fall.

1. Remove the panels from the unit.
2. Remove the four bolts attaching the unit to the skid; they are inside unit base.
3. Align a forklift so the tines can be inserted under the unit. Use the center of gravity indicators on the unit panels when determining the entry points for the tines.
4. Insert the tines of the forklift completely under the base of the Liebert PDX or Liebert PCW.
5. Lift the unit off the skid—no more than 6" (152mm)—and remove the skid.

Figure 13 Remove the unit from the skid with a forklift



4.2.2 Removing the Unit from the Skid Using Rigging

1. Remove the fasteners holding the unit to the skid as stated in **4.2.1 - Removing the Unit from the Skid With a Forklift**.
2. Place slings under the unit using spaces between the skid deck boards. Use the center of gravity indicators on the unit to determine the position of the slings (see **Figure 14**).

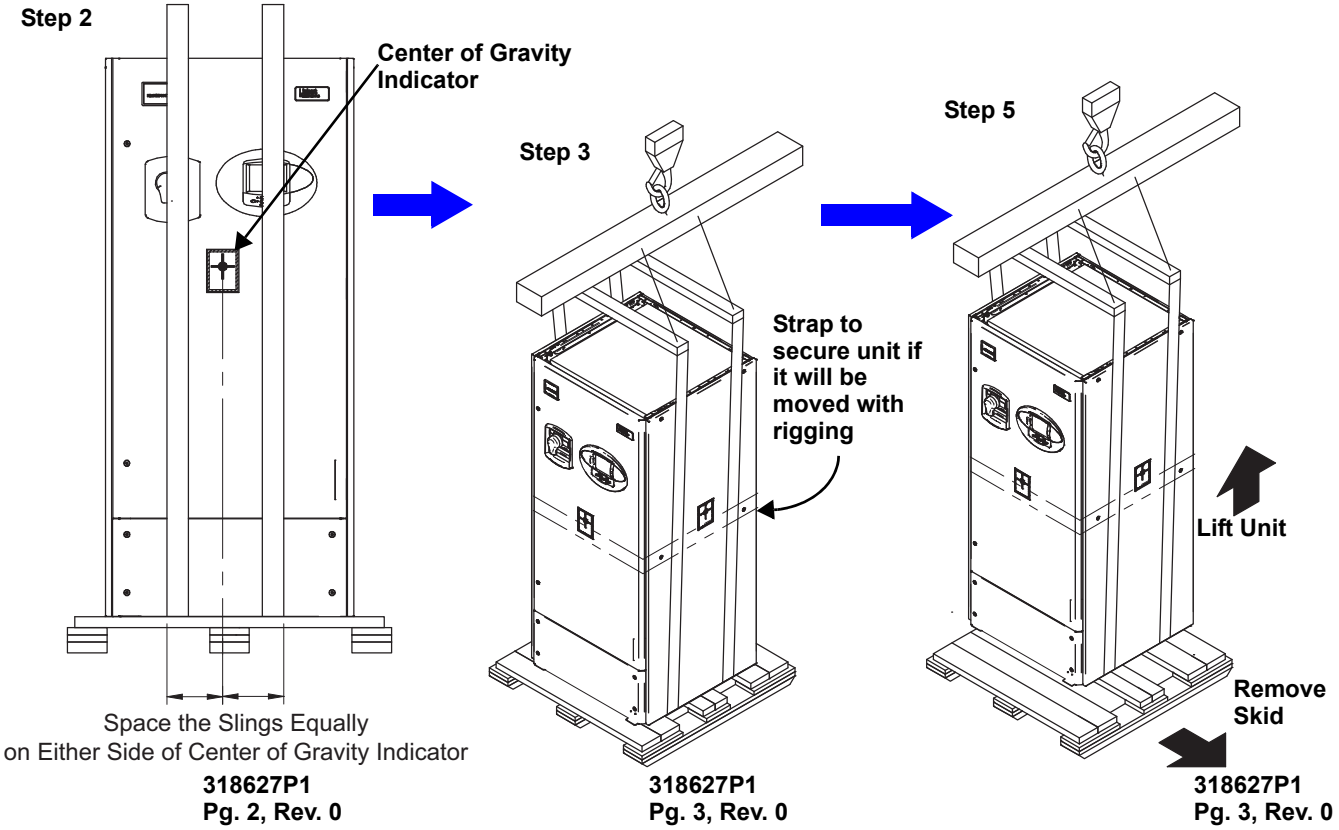
WARNING

Risk of improper moving. Can cause equipment damage, injury or death.

The slings must be equally spaced on either side of the center of gravity indicator. Improper spacing or placement of the tines may cause the unit to tip and fall.

3. Use spreader bars or an equivalent device to protect the unit from crushing when it is lifted with the slings. Ensure that the unit's panels, if attached, are protected from the slings.
4. **If rigging is to be used to move the unit closer to the site for installation**, place one or two horizontal straps around the unit at mid-height (see **Figure 14**).
5. Lift the unit off the skid.
6. Remove the skid from under the unit.

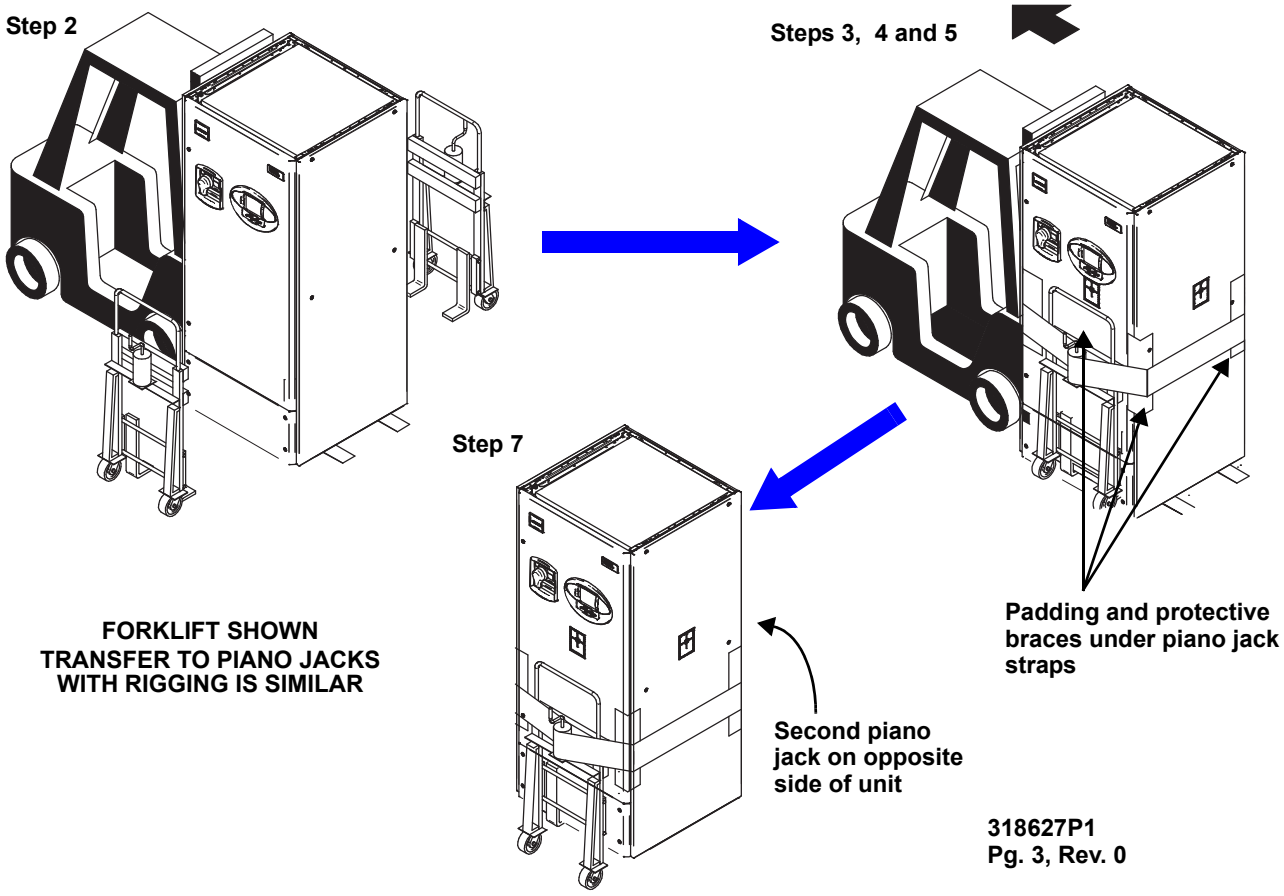
Figure 14 Remove the unit from the skid with rigging



4.2.3 Moving the Unit With Piano Jacks

1. Raise the unit with a forklift, pallet jack or rigging according to the instructions in either **4.2.1 - Removing the Unit from the Skid With a Forklift** or **4.2.2 - Removing the Unit from the Skid Using Rigging**
2. Position a piano jack on either side of the elevated unit.
3. Lower the unit to a height suitable for the piano jacks.
4. Place protective padding between the unit and the piano jacks and straps.
5. Secure the unit to the piano jacks with the straps.
6. Lower the forklift tines and move the forklift away.
7. Roll the unit to the installation site. Emerson recommends having at least two properly trained and qualified personnel move the unit.
8. Lower the unit as far as the piano jacks will allow.
9. Undo all straps holding the unit to the piano jacks.
10. Use a pry bar or similar device to lift one end of the unit enough to remove one piano jack.
11. Repeat **Step 10** to remove the remaining piano jack.
12. Remove the padding used to protect the unit from the piano jacks and strapping.

Figure 15 Moving the unit with piano jacks



4.3 Placing the Unit on a Floor Stand

Liebert Floor Stand—Refer to the floor stand installation sheet, 319112, shipped inside the floor stand package. Lower the unit onto the floor stand.

NOTE

The floor stand for a Liebert PDX and Liebert PCW is not symmetrical. Its orientation to the Liebert PDX and Liebert PCW is critical for installation of the unit.

5.0 ELECTRICAL CONNECTIONS

Three-phase electrical service is required for all models. Electrical service must conform to national and local electrical codes. Refer to equipment nameplate regarding wire size and circuit protection requirements. Refer to electrical schematic when making connections. Refer to **Figure 16** for electrical service entrances into unit.

A manual electrical disconnect switch should be installed in accordance with local codes and distribution system. Consult local codes for external disconnect requirements.

NOTE

Unit Input Power Requirements

For three-phase units, only three power wires and an earth ground are required. A neutral is not required at the unit input connections.

WARNING

Arc flash and electric shock hazard. Open all local and remote electric power disconnect switches, verify with a voltmeter that power is Off and wear personal protective equipment per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

Installation and service of this equipment should be done only by qualified personnel who have been specially trained in the installation of air conditioning equipment.

Follow all local codes.

NOTE

Seal openings around piping and electrical connection to prevent air leakage. Failure to do so could reduce the unit's cooling performance.

WARNING

Risk of improper wire and loose electrical connections. Can cause overheated wire and electrical connection terminals resulting in smoke, fire, equipment and building damage, injury or death.

Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward compressor rotation and unit damage.

Service technicians should use a gauge set on the Liebert PDX and Liebert PCW system during the initial startup to verify that the three-phase power is connected properly. The EC fans are not a reliable indicator of proper connection. The blowers will rotate the same direction, regardless of the three-phase power input.

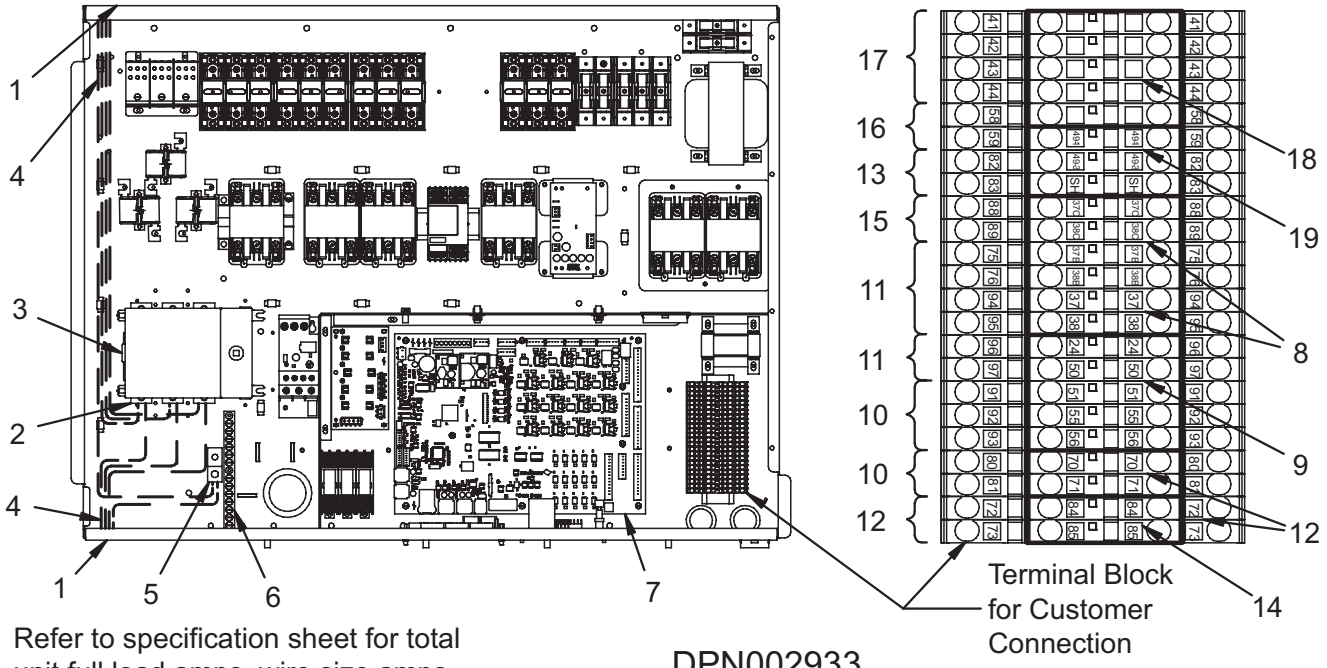
Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that scroll compressors rotate in the proper direction.

NOTICE

Risk of improper electrical supply connection. Can cause equipment damage.

See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

Figure 16 Electrical field connections—Upflow and downflow models



5.1 Standard Electrical Connections

Source: DPN002933, Rev. 0

1. **Electric conduit knockouts** on top and bottom of electric box; knockout size, 1.75in (44.5mm).
2. **Three-phase connection**—Electric service connection terminals.
3. **Factory-installed disconnect switch**—Fused disconnect switch provided on units.
4. **Three-phase electric service** field-supplied.
5. **Earth ground connection**—Connection terminal for field-supplied earth grounding wire.
6. **Earth ground bar (optional)**—Connection terminals with factory ground from each high-voltage component for field-supplied earth grounding wire.
7. **Control and monitoring** section of electric box.
8. **Remote unit shutdown**—Replace existing jumper between Terminals 37 + 38 with normally closed switch having a minimum 75VA, 24VAC rating. Use field-supplied Class 1 wiring. Two additional contact pairs available as an option (labeled as 37B & 38B, 37C & 38C). Replace existing jumper for appropriate pair as done for Terminals 37 & 38.
9. **Remote Alarm Device (RAD) Connections**—Field-supplied 24V Class 1 wiring for special alarm. Connection made by adding normally open contacts. Special alarm connections may be factory wired or field wired. See schematic, RADS1-4, for factory-wired special alarms. For field-wired special alarms, use 24V Class 1 wiring to connect normally open contacts between Terminals 24 & 50, 24 & 51, 24 & 55, or 24 & 56.
10. **Smoke detector alarm connections**—Field-supplied 24V Class 1 wiring to remote alarm circuits. Factory-wired contacts from optional smoke detector are #91-Common, #92-NO, and #93-NC. Optional smoke detector trouble connections #80 & # 81.
11. **Common alarm connection**—Field-supplied 24V Class 1 wiring to common alarm terminals 75 + 76 (and optional 94 + 95, and 96 + 97), which are factory-connected to common alarm relay (R3).
12. **Heat rejection connection**—Field-supplied 24V Class 1 wiring to interlock heat rejection from pigtails 70 + 71 which are factory-connected to compressor side switch (self-contained units only) or to GLYCOOL relay (K11, GLYCOOL units only).

    On Dual Cool units only, pigtails 72 + 73 connect auxiliary cooling source to GLYCOOL relay K11.

    See indoor and outdoor electric schematic for more information.

13. **Reheat and Humidifier Lockout**—Optional emergency power lockout of reheat and/or humidifier: Connections provided for remote 24VAC source. Class 1 wiring to connections #82 & #83.
14. **Main Fan Auxiliary Switch**—Optional main fan auxiliary side switch. Terminals located in field wiring compartment for remote indication that the evaporator fan motor/unit is on. Field to connect 24V maximum, Class 1 wiring to connections #84 & #85.
15. **Optional Condensate Alarm** (Dual Float Condensate Pump only)—Relay terminals located in field wiring compartment for remote indication. Class 1 wiring to connections #88 & #89.
16. **Optional Remote Liebert Liqui-tect® Indicator**—Optional remote Liebert Liqui-tect indicator for unit shutdown. Terminals located in field wiring compartment. Field to connect 24V maximum, Class 1 wiring to connections #58 & #59.
17. **Optional Analog Inputs #3 & #4**—Customer connection to Terminals 41, 42, 43, 44 for analog inputs.
18. **Spare Terminals for Optional Devices**—Customer connection when optional device is supplied. See unit schematic.
19. **Heat Rejection CANBUS Connection (AIR Units only)**—Customer connection to terminals 49-1, 49-3 and SH.

NOTE

CANbus wiring is required to access all system and Liebert iCOM® functions when using the Liebert MC™ Premium Efficiency Control Condenser. See Liebert MC manual, SL-19536, for additional CANBUS wiring details. The manual ships with the unit and is available at Liebert's Web site: ***www.liebert.com***

Figure 17 CANbus communication and interlock connections between Liebert PDX and Liebert MC™ (premium

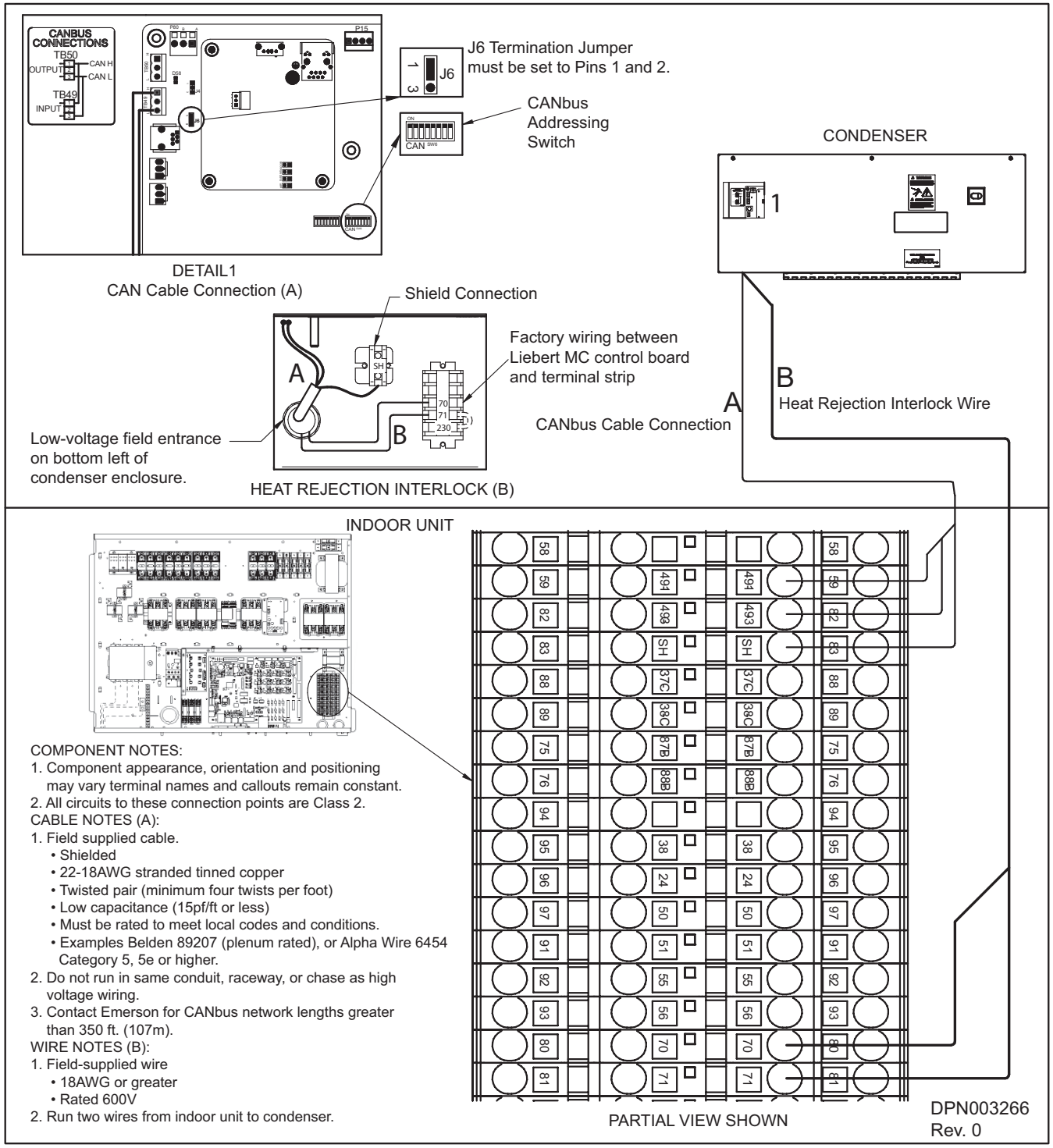
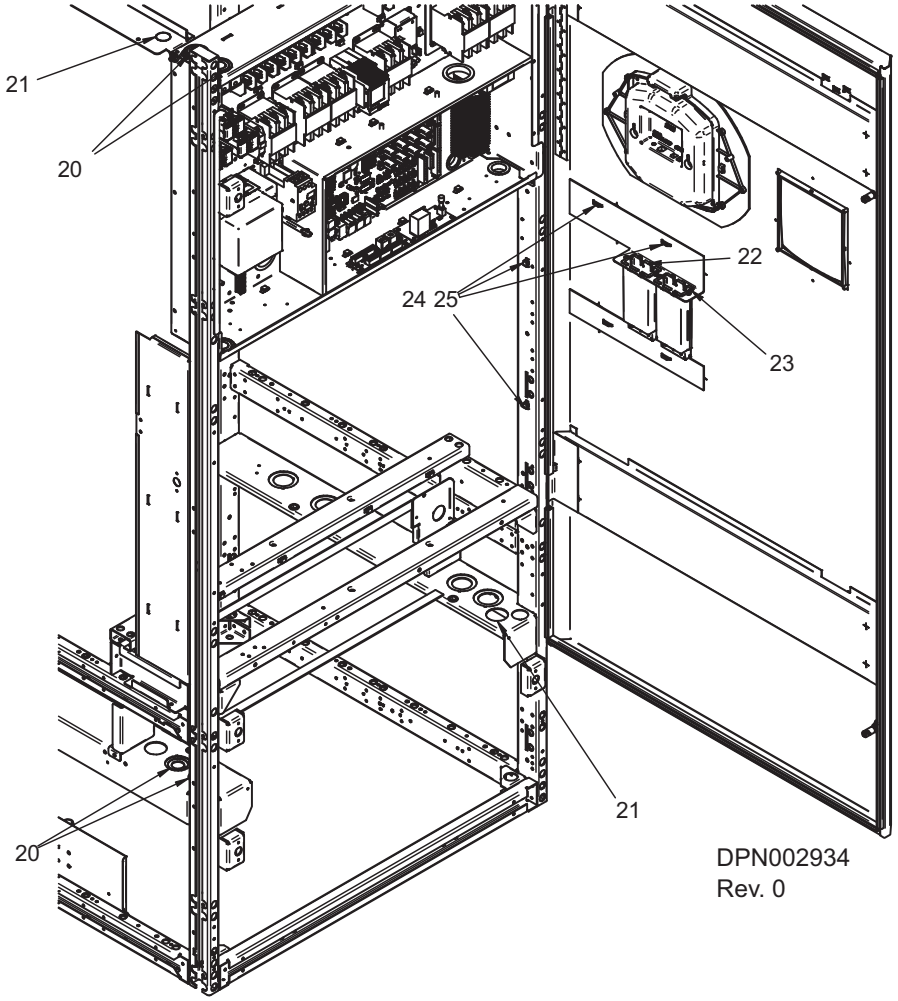
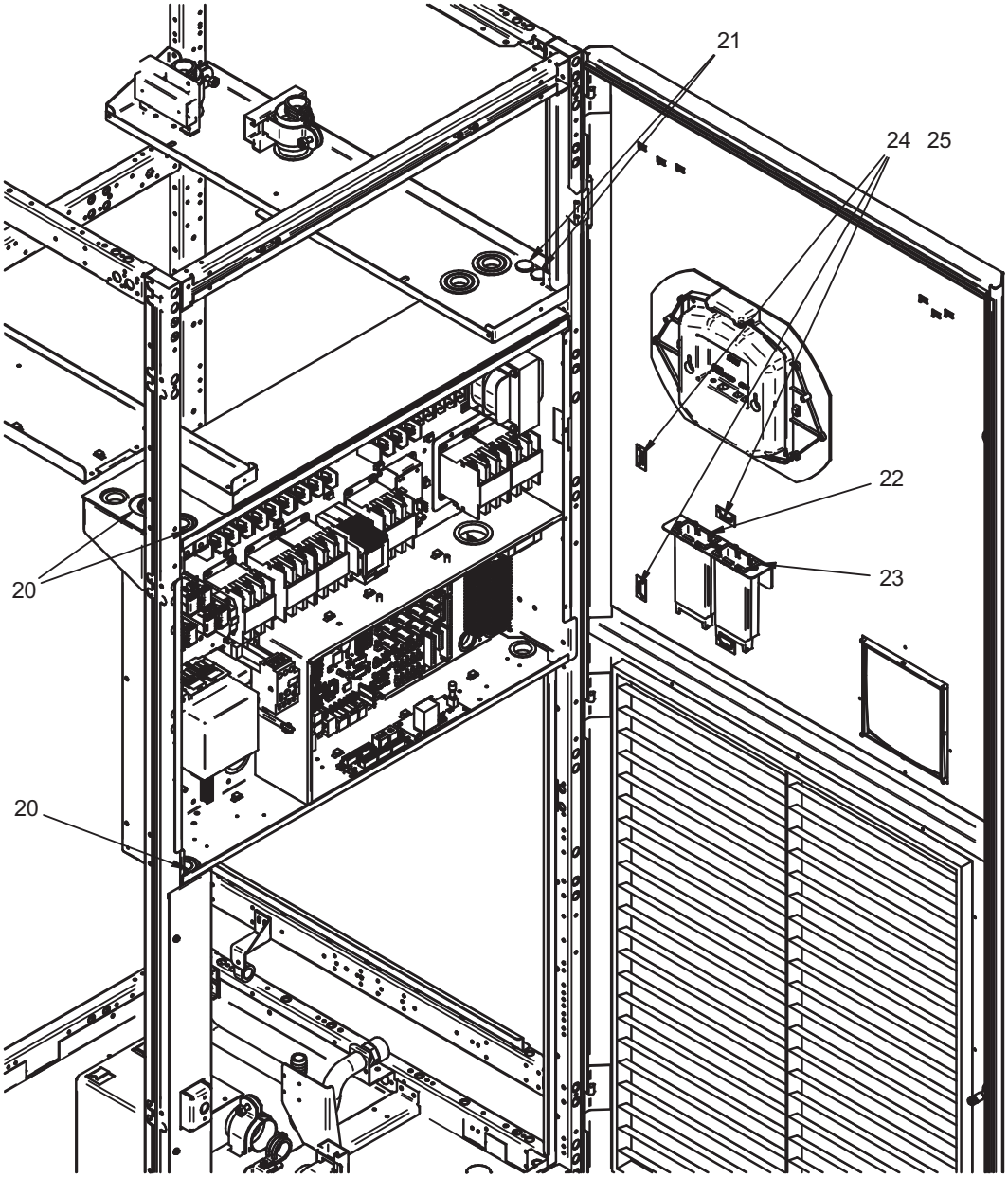


Figure 18 Electrical field connections for Liebert iCOM®—Downflow models



20) Opening for field wiring; suggested entry point for high-voltage field wiring to unit.
21) Opening for field wiring; suggested entry point for low-voltage field wiring to unit.
22) Vacant Liebert IntelliSlot™; may contain optional Liebert IntelliSlot cards.
23) Populated Liebert IntelliSlot; optional Liebert IntelliSlot cards may be placed in either of two supplied Liebert IntelliSlot locations.
24) Wire tie anchors; use to secure field-supplied network cables to Liebert IntelliSlot.
25) Wire tie anchors; use to secure customer Ethernet wiring to control board and display.

Figure 19 Electrical field connections for Liebert iCOM®—Upflow models



DPN002935
Rev. 0

20) Opening for field wiring; suggested entry point for high-voltage field wiring to unit.
21) Opening for field wiring; suggested entry point for low-voltage field wiring to unit.
22) Vacant Liebert IntelliSlot™; may contain optional Liebert IntelliSlot cards.
23) Populated Liebert IntelliSlot; optional Liebert IntelliSlot cards may be placed in either of two supplied Liebert IntelliSlot locations.
24) Wire tie anchors. Use to secure field-supplied network cables to Liebert IntelliSlot.
25) Wire tie anchors. Use to secure customer Ethernet wiring to control board and display.

5.2 Supply Temperature Sensor

The Liebert iCOM® is equipped with a supply (discharge) air temperature sensor. The sensor can be used to provide a consistent supply air temperature by adjusting the compressor capacity or chilled water valve position on downflow units or for monitoring only on upflow or downflow units.

The supply sensor must be installed 5-15 ft. (1.5-4.5m) from the unit to provide an accurate reading.

A 50 ft. (15m) extension cable (P/N 186978G5) is available if the sensor must be farther than 15 ft. (4.5m) from the Liebert iCOM.

See the Liebert iCOM user manual, SL-18835, for more information on supply air temperature monitoring, control or limit setup. The manual is available at Liebert's Web site: **www.liebert.com**

6.0 PIPING

All fluid and refrigeration connections to the unit, with the exception of the condensate drain, are sweat copper. Factory-installed piping brackets must not be removed. Field-installed piping must be installed in accordance with local codes and must be properly assembled, supported, isolated and insulated. Avoid piping runs through noise-sensitive areas, such as office walls and conference rooms.

Refer to specific text and detailed diagrams in this manual for other unit-specific piping requirements.

All piping below the elevated floor must be located so that it offers the least resistance to air flow. Careful planning of the piping layout under the raised floor is required to prevent the air flow from being blocked. When installing piping on the subfloor, it is recommended that the pipes be mounted in a horizontal plane rather than stacked one above the other. Whenever possible, the pipes should be run parallel to the air flow.

6.1 Fluid Connections—Condensate and Humidifier

NOTICE

Risk of clogged or leaking drain lines. Can cause equipment and building damage.

This unit requires a water drain connection. Drain lines must be inspected regularly and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks. This unit may also require an external water supply to operate.

Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in severe property damage and loss of critical data center equipment.

Do not locate unit directly above any equipment that could sustain water damage.

Emerson recommends installing a monitored fluid detection system to immediately discover and report coolant fluid system and condensate drain line leaks.

NOTE

Seal openings around piping and electrical connection to prevent air leakage. Failure to do so could reduce the unit's cooling performance.

6.1.1 Condensate Piping—Field-Installed

- Do not reduce drain lines
- Do not expose drain line to freezing temperatures
- Drain line may contain boiling water. Use copper or other suitable material
- Drain line must comply with local building codes
- Emerson recommends installing under-floor leak detection equipment

See **Figures 26** through **34** for condensate connection locations.

Gravity Drain—Units Without Factory-Installed Condensate Pump

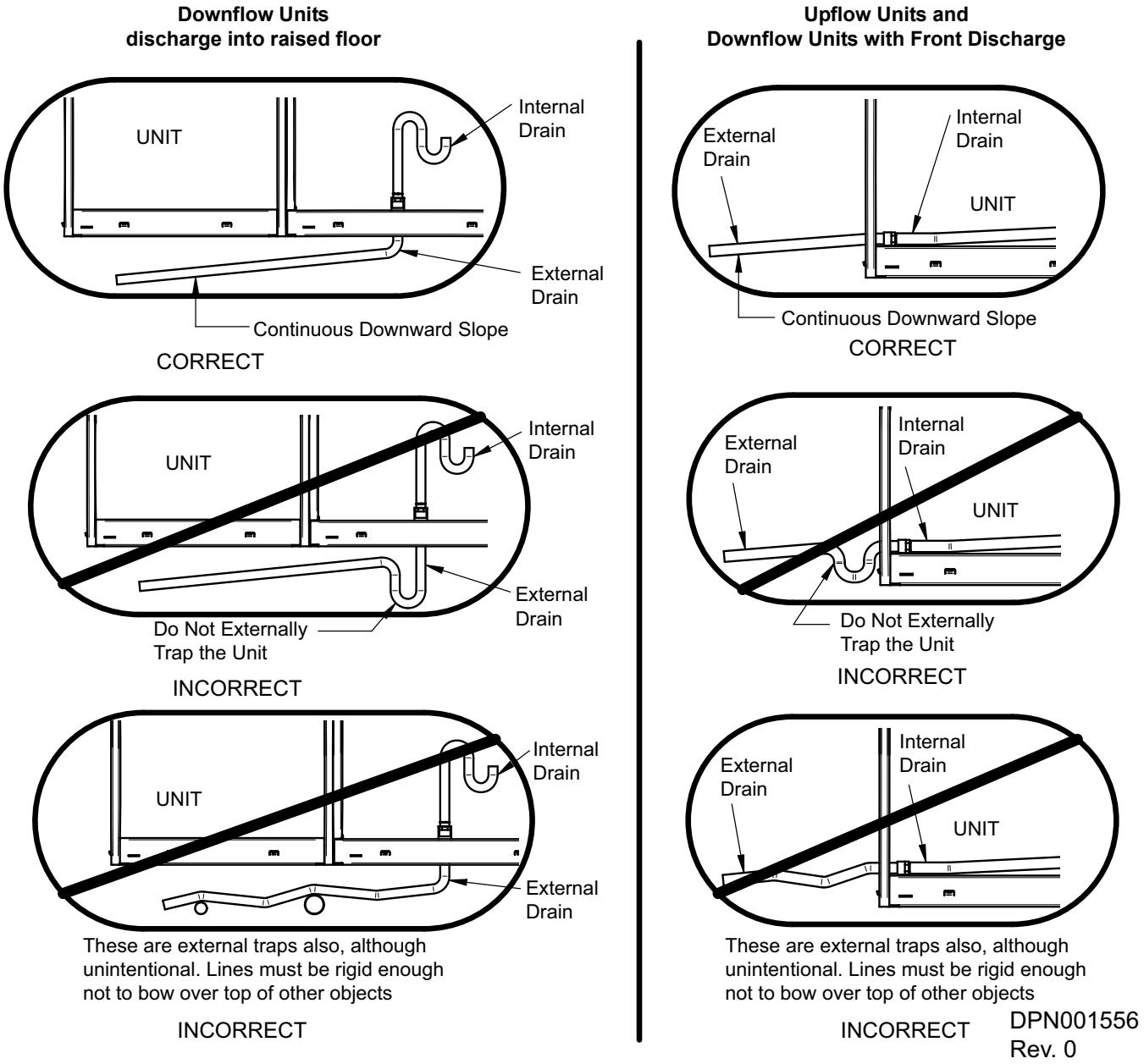
- 3/4" FPT drain connection is provided on units **without** optional factory-installed condensate pump
- Pitch drain line toward drain a minimum of 1/8" (3mm) per 1 foot (305mm) of length
- Drain is trapped internally. Do not trap external to equipment
- Drain line must be sized for 2 gpm (7.6 l/m) flow

NOTICE

Risk of double trapping the unit drain line. Can cause drain water to back up and overflow the unit cabinet resulting in expensive building and equipment damage.

Do not install an external drain line trap. A drain line trap has been factory-installed inside the unit.

Figure 20 Gravity drain



Condensate Pump

- 1/2" copper connection is provided on units with optional, factory-installed condensate pump
- 208V condensate pump rated for 5 GPM at 45 ft. (18.9/m at 13.7m) of total head pressure
- 230V condensate pump rated for 5 GPM at 48 ft. (18.9l/m at 14.6m) of total head pressure
- 460V condensate pump rated for 5 GPM at 40 ft. (18.9l/m at 12.2m) of total head pressure

Size piping based on available condensate head.

NOTE

Condensate pumps are factory-installed on upflow units; they are shipped separately to be field- installed on downflow units.

6.1.2 Humidifier Supply Water—Optional Infrared

- 1/4" supply line; maximum water pressure is 150 psi (1034kPa)
- Size humidifier supply line for 1 gpm (3.8 l/m), with a minimum water pressure of 20 psi (138kPa)
- Do not supply de-ionized water to the humidifier

6.1.3 Humidifier Supply Water—Optional Steam Generating

- 1/4" supply line; maximum water pressure is 145psi (1000kPa)
- Fill valve is sized for pressure range of 30 to 120psi (207-827kPa)
- Do not supply steam generating humidifier with softened water
- Do not use hot water source
- Water conductivity must be in the range of 330-750 micro-siemens

6.2 Refrigeration Piping—Air-Cooled Units

WARNING

Risk of explosive discharge from high-pressure refrigerant. Can cause injury or death.

This unit contains fluids and/or gases under high pressure.

Relieve pressure before working with piping.

WARNING

Risk of refrigerant system rupture or explosion from over pressurization. Can cause equipment damage, injury or death.

Use extreme caution when charging the refrigerant system. Do not pressurize the system higher than the design pressure marked on the unit's nameplate.

NOTE

The Liebert indoor cooling unit has a factory-installed high-pressure safety switch in the high side refrigerant circuit. A pressure relief valve is provided with Liebert Lee-Temp™ condensers. Consult local building codes to determine whether the Liebert MC™ condensers will require field-provided pressure relief devices.

NOTICE

Risk of oil contamination with water. Can cause equipment damage.

Liebert PDX systems require the use of POE (polyolester) oil. See **10.11.1 - Compressor Oil** for requirements. POE oil absorbs water at a much faster rate when exposed to air than previously used oils. Because water is the enemy of a reliable refrigeration system, extreme care must be used when opening systems during installation or service. If water is absorbed into the POE oil, it will not be easily removed and will not be removed through the normal evacuation process. If the oil is too wet, it may require an oil change. POE oils also have a property that makes them act as a solvent in a refrigeration system. Maintaining system cleanliness is extremely important because the oil will tend to bring any foreign matter back to the compressor.

NOTICE

Risk of improper refrigerant charging. Can cause equipment damage.

Refrigerant charge must be weighed into scroll and digital scroll compressors before they are started. Starting scroll and digital scroll compressors without proper refrigerant charging can cause the compressors to operate at less than 5°F (-15°C) evaporator temperature and at less than 20psig (138kPa). Operation for extended periods at less than 20psig (138kPa) can cause premature compressor failure.

6.2.1 Piping Guidelines—Air-Cooled Units

- Indoor unit ships with a nitrogen holding charge; do not vent the evaporator until all refrigerant piping is in place, ready for connection to the unit and condenser
- Use copper piping with a brazing alloy with a minimum temperature of 1350°F (732°C), such as Sil-Fos. Avoid soft solders, such as 50/50 or 95/5.

  Use a flow of dry nitrogen through the piping during brazing to prevent formation of copper oxide scale inside the piping. When copper is heated in the presence of air, copper oxide forms. POE oils will dissolve these oxides from inside the copper pipes and deposit them throughout the system, clogging filter driers and affecting other system components.
- A pure dry nitrogen flow of 1-3ft^3/min (0.5-1.5 l/s) inside the pipe during brazing is sufficient to displace the air. Control the flow using a suitable measuring device.
- Ensure that the tubing surfaces to be brazed are clean and that all burrs have been removed from
- the ends of the tubes.
- Ensure that all loose material has been cleaned from inside the tubing before brazing.
- Protect all refrigerant line components within 18" (460mm) of the brazing site by wrapping them with a wet cloth or with a suitable heat sink compound.
- Isolate piping from building using vibration-isolating supports
- Refer to **Table 8** for piping sizes
- Refer to condenser installation manual for charging information
- Install traps on hot gas (discharge) lines at the base of vertical risers and every 25 feet (7.6m) of vertical rise.
- Pitch horizontal hot gas piping down at a minimum rate of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of refrigerant/oil flow.
- Condenser cannot be installed below the evaporator. The maximum height of the condenser above the evaporator is 60 feet (18.3m).
- Consult factory if piping run exceeds 150 feet (46m) equivalent length
- Keep piping clean and dry, especially on units with R-410A refrigerant
- Avoid piping runs through noise-sensitive areas
- Do not run piping directly in front of airstream
- Refrigerant oil – do not mix oil types (see **10.11.1 - Compressor Oil**)
- Refer to ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping. The Liebert indoor cooling unit has a factory-installed high-pressure safety switch in the high side refrigerant circuit. Consult building codes to determine whether condensers without receivers require field-provided pressure relief devices. A fusible plug kit is available for field installation.

Table 8 Recommended refrigerant line sizes - OD copper (inches)*

Standard Scroll and Digital Scroll Models						
Model	**PX018**		**PX023**		**PX029**	
Equivalent Length	**Hot Gas Line**	**Liquid Line**	**Hot Gas Line**	**Liquid Line**	**Hot Gas Line**	**Liquid Line**
50 ft. (15m)	5/8	1/2	3/4	5/8	7/8	5/8
100 ft. (30m)	5/8	1/2	3/4	5/8	7/8	5/8
150 ft. (45m)	5/8	1/2	3/4	5/8	7/8	5/8
300 ft. (91m)	7/8	5/8	7/8	5/8	1-1/8	3/4

Source: DPN000788, Rev. 0

Table 9 Indoor unit approximate refrigerant charge for R-410A

System Type	Model	R-410A Charge lb (kg)
Air-Cooled	PX018	5.0 (2.3)
	PX023	5.3 (2.4)
	PX029	5.8 (2.6)

Table 10 Interconnecting piping refrigerant charge

Line Size, O.D., in.	R-410A, lb/100 ft. (kg/30m)	
	Liquid Line	Hot Gas Line
3/8	3.2 (1.4)	—
1/2	5.9 (2.7)	0.7 (0.3)
5/8	9.6 (4.3)	1.1 (0.5)
3/4	14.3 (6.4)	1.6 (0.7)
7/8	19.8 (8.8)	2.3 (1.0)
1-1/8	33.8 (15.1)	3.9 (1.7)
1-3/8	51.5 (23.0)	5.9 (2.6)

Source: DPN003099, Rev. 0

Table 11 Condenser refrigerant charge

Standard Condenser Models	Approximate R-410A Refrigerant Needed	
	Condensers Without Liebert Lee-Temp™	Condensers With Liebert Lee-Temp
MCS028	2.5 (1.2)	18.3 (8.4)
MCM040	3.5 (1.6)	19.3 (8.8)
MCL055	5.0 (2.3)	24.2 (11.0)
MCM080	8.5 (3.8)	39.6 (18.1)
MCL110	10.7 (4.9)	49.0 (22.2)
MCL165	18.4 (8.4)	79.9 (36.2)

Source: DPN002411, Rev. 6

6.2.2 Scroll and Digital Scroll—Additional Oil Requirements

System charges over 40 lb (18.1kg) per circuit may require additional oil charge to be added. See **Table 12** for the amount required for various system charge levels.

After the system has been fully charged with refrigerant, use a hand pump to add the additional oil at the suction side of the system while the system is running.

The amount of oil added by field service must be recorded on the tag marked "Oil Added Field Service Record," attached to each compressor. The date of oil addition must be included as well.

Table 12 Additional oil required per refrigerant charge

	System Charge Per Circuit, lb. (kg) *								
	40 lb. (18.1kg)	60 lb. (27.2kg)	80 lb. (36.3kg)	100 lb. (45.4kg)	120 lb. (54.4kg)	140 lb. (63.5kg)	160 lb. (72.6kg)	180 lb. (81.6kg)	200 lb. (90.7kg)
Model	Additional Oil Required Per Circuit, Ounces (Grams)								
PX018	8	12	16	20	24	28	32	36	40
PX023	8	12	16	20	24	28	32	36	40
PX029	12	18	24	30	36	42	48	54	60

* For system charges over 200 lb. (90.7kg), consult your Emerson representative.

NOTICE

Risk of improper compressor lubrication. Can cause compressor and refrigerant system damage.

Failure to use oil types, viscosities and quantities recommended by the compressor manufacturer may reduce compressor life and void the compressor warranty. See **Table 20** for compressor oil types.

- Do not mix polyolester (POE) and mineral-based oils.
- Do not mix oils of different viscosities.
- Consult your Emerson® representative at 1-800-LIEBERT or the compressor manufacturer if questions arise.

6.2.3 Air-Cooled Condenser Without Liebert Lee-Temp™ System

Evacuation Air-Cooled Models

Proper leak check and evacuation can be accomplished only with all system valves open and check valves accounted for.

NOTE

The system includes a factory-installed check valve and an additional downstream Schrader valve with core in the compressor discharge line. Proper evacuation of the condenser side of the compressor can be accomplished only using the downstream Schrader valve. See piping schematic.

1. If unit power is available, open the unit liquid line solenoid valves using the evacuation function for System #1 in the diagnostic section of the Liebert iCOM® control. If unit power is not available, a field-supplied 24VAC / 75VA power source must be directly connected to the unit solenoid valve.
2. Connect refrigerant gauges to the suction rotalock valves and discharge line Schrader valves.
3. Open the service valves and place a 150 PSIG (1034 kPa) of dry nitrogen with a tracer of refrigerant. Check system for leaks with a suitable leak detector.
4. After completion of leak testing, release the test pressure (per local code) and pull an initial deep vacuum of 500 microns on the system with a suitable pump.
5. After four hours, check the pressure readings and, if they have not changed, break vacuum with dry nitrogen. Pull a second and third vacuum to 500 microns or less. Recheck the pressure after two hours. After completing this step, proceed to the next section.

Calculating Charging Values for Liebert MC™ Condenser Systems, Units without Liebert Lee-Temp™ Systems

The system must be fully piped and evacuated before it can be charged. See **Evacuation Air-Cooled Models on page 35**.

Liebert MC condensers are charge-sensitive and require accurate calculation of the system charge to avoid overcharging. To avoid overcharge, additional guidelines are recommended to ensure trouble free operation.

- When charging system in an outdoor ambient below 50°F (10°C), recheck the subcooling against **Table 13** when the ambient is above 60°F (15.6°C)
- The indoor space should be maintained at 70 to 80°F (21 to 26.7°C) return air before final charge adjustments are made.
- Charging unit at greater than 80°F (26.7°C) return air may result in the unit being overcharged.
- Charge by subcooling measurement at the indoor unit. See **Table 13** for target subcooling temperatures.
- Pressure and temperature measuring instruments should be capable of measuring to ±10 psig (103.4kPa) and ± 2°F (1.1°C) for best subcooling measurement.

1. Check indoor nameplate for refrigerant type to be used. Unit control configurations differ depending on refrigerant type.
2. Refrigerant charging requires unit operation. Refer to the indoor unit's user manual for details regarding indoor unit operation and to the Liebert MC user manual, SL-19536, available at the Liebert Web site (**www.liebert.com**), for the Liebert MC condenser operation.
3. Calculate the amount of charge for the system. Refer to the indoor unit user manual and to the condenser and refrigerant line charge data in the Liebert MC user manual, SL-19536, available at the Liebert Web site.
4. Accurately weigh in as much of the system charge as possible before starting the unit. Do not exceed the calculated charge by more than 0.5 lb (.23kg).

NOTICE

Risk of improper refrigerant charging. Can cause equipment damage.

Refrigerant R-410A is a blended refrigerant and must be introduced and charged from the cylinder only as a liquid.

When adding liquid refrigerant to an operating system, it may be necessary to add the refrigerant through the compressor suction service valve. Care must be exercised to avoid damage to the compressor. Emerson recommends connecting a sight glass between the charging hose and the compressor suction service valve. This will permit adjustment of the cylinder hand valve so that liquid can leave the cylinder while allowing vapor to enter the compressor.

NOTICE

Risk of refrigerant overcharge. Can cause equipment damage.

Do not use the sight glass as an indicator when charging Liebert MC condenser systems.

5. Turn On the Liebert MC disconnect switch.
6. Turn on the indoor unit disconnect switch. Operate the unit for 30 minutes using the charging function of the indoor unit control for each circuit of the system. The charging function is in the diagnostic section of the Liebert iCOM® control (see Liebert iCOM user manual, SL-18835). The charging function operates the compressor at full capacity and energizes the liquid line solenoid valve. The reheat and humidifier are disabled. Manual operation of the indoor fan from the diagnostic menu of the Liebert iCOM is required. A minimum 20psig (138kPa) must be established and maintained for the compressor to operate. The charging function can be reset as many times as required to complete unit charging.
7. Attach pressure and temperature instruments to the liquid line of the indoor unit. Measure the initial subcooling and continue to add charge until recommended subcooling for the current outdoor ambient temperature is reached. See **Table 13**. The outdoor ambient can be read from the Liebert MC condenser control menu ID F02.

NOTE

To determine subcooling measurement, a liquid line pressure reading (at the factory-installed Schrader tap) needs to be measured along with obtaining a temperature reading on the liquid line. Convert the liquid line pressure reading into a temperature by utilizing a Pressure-Temperature Guide or **Table 15**. *The difference between this converted temperature and the actual temperature will determine the system's subcooling.*

Table 13 Target subcooling for ambient outdoor temperature

Ambient Temp °F (C°)	Subcooling °F (C°)
0 (-17.8)	22 (12.0)
10 (-12.2)	22 (12.0)
20 (-6.7)	22 (12.0)
30 (-1.1)	22 (12.0)
40 (4.4)	22 (12.0)
50 (10.0)	21 (11.7)
60 (15.6)	19 (10.8)
70 (21.1)	17 (9.3)
80 (26.7)	13 (7.2)
90 (32.2)	9 (5.0)
95 (35.0)	7 (3.9)
100 (37.8)	5 (2.9)
105 (40.6)	3 (1.8)
110 (43.3)	1 (0.7)
125 (51.7)	0

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8. Verify the subcooling calculated from measured values at the evaporator against the subcooling reading of the Liebert MC™ control [menu ID F50]. If the subcooling calculated with gauges differs from the Liebert MC subcooling by more than 3°F (1.7°C), then adjust the charge amount to achieve the target subcooling per **Table 13** based the Liebert MC control subcooling. Failure to check measured subcooling with refrigerant gauges vs. Liebert MC subcooling may result in an overcharged system. See **Note** below and **Table 14** for corrections to Liebert MC subcooling that may be required based on condenser elevation above the indoor evaporator.

NOTE

The evaporator subcooling will be greater than the condenser subcooling when the Liebert MC is mounted higher than the indoor evaporator. Subcooling adjustment is needed when the Liebert MC is more than 40 ft. (12m) above evaporator.

NOTE

Subcooling should be viewed at the Liebert MC condenser for a minimum of 1 minute and the subcooling should be approximately ±2°F before recording subcooling to be compared against subcooling from the field refrigerant gauges and thermometers.

Sample Calculations

The Liebert MC is 40 ft. (12.2m) above the evaporator of an R-410A system. The outdoor ambient from the Liebert MC condenser control menu ID F02, is 94.8°F (34.9°C). The liquid pressure is 421 psig (2903kPA) and the liquid temperature is 113°F (45.1°C). The subcooling from the Liebert MC control is 7°F (3.9°C). Determine the subcooling and verify the calculated subcooling against the reading of the Liebert MC control (menu ID F50).

Evaporator Subcooling Calculation

Refrigerant Type		R-410A
1.	Ambient Temperature	94.8°F (34.9°C)
2.	Condenser Elevation	40ft. (12.2m)
3.	Condenser Elevation Temperature Correction	2°F (1.1°C)
4.	Liquid Line Pressure	421psig (2902kPa)
5.	Liquid Pressure Converted to Saturated Liquid Temperature	120.3°F (49.0°C)
6.	Measured Liquid Line Temperature	113.2°F (45.1°C)
7.	MC Condenser Subcooling Reading (Menu ID F50)	7°F (3.9°C)

Subtract Line **6** (Measured Line Temperature) from Line **5** (Liquid Pressure converted to Temperature) to obtain Calculated Subcooling.

Line 5		120.3°F	(49.0°C)
Line 6		-113.2°F	(45.1°C)
8.	Calculated Subcooling	**7.1°F or 7°F**	**(3.9°C or (4°C)**

Elevation Correction

Subtract Line **3** (Condenser Elevation Temperature Correction) from Line **8** (Calculated Subcooling) to obtain Corrected Subcooling.

Line 8		7°F	(3.9°C)
Line 3		-2°F	- (2.2°C)
9.	Corrected Subcooling	**5°F**	**(1.7°C)**

Verification Against MC Condenser

Subtract Line **7** (MC Condenser Subcooling Reading) from Line **9** (Corrected Subcooling) to obtain Difference.

Line 9	5°F	(1.7°C)
Line 7	-7°F	-(2.8°C)
10. Difference	**-2°F**	**(-1.1°C)**

- If Line **10** (Difference value) is less than ± 3°F (±1.7°C), NO charge adjustment is needed.
- If Line **10** (Difference value) is less than -3°F (-1.7°C), add additional charge.
  If Line **10** (Difference value) is greater than +3°F (+1.7°C), the system is overcharged and some of the charge must be removed.

Table 14 Difference in subcooling measurements—Indoor minus outdoor

Liebert MC™ Elevation Above Evaporator, ft (m)		Elevation Subcooling Correction - °F(°C)			
		80 (24)	60 (18)	40 (12)	20 (6)
Refrigerant	R-410A	6 (3.3)	4 (2.2)	2 (1.1)	0 (0.0)

* Assumes liquid line is sized for no more than 2°F (1.1°C)pressure drop.

9. As head pressure builds, the variable fan speed controlled condenser fan begins rotating. The fan will run at full speed when sufficient head pressure is developed.

Table 15 Liquid pressure and temperature chart

Pressure		R-410A *	
PSIG	Bar	°F	°C
170	11.7	59.8	15.4
180	12.4	63.1	17.3
190	13.1	66.3	19.1
200	13.8	69.5	20.8
210	14.5	72.5	22.5
220	15.2	75.4	24.1
230	15.9	78.2	25.7
240	16.6	80.9	27.2
250	17.2	83.6	28.7
260	17.9	86.2	30.1
270	18.6	88.7	31.5
280	19.3	91.1	32.8
290	20.0	93.5	34.2
300	20.7	95.8	35.5
310	21.4	98.1	36.7
320	22.1	100.3	38.0
330	22.8	102.5	39.2
340	23.4	104.6	40.3
350	24.1	106.7	41.5
360	24.8	108.7	42.6
370	25.5	110.7	43.7
380	26.2	112.7	44.8
390	26.9	114.5	45.9
400	27.6	116.4	46.9
500	34.5	133.5	56.4
600	41.4	148.1	64.5

* Values are for saturated liquid
Source: DPN002411, Rev. 6

Evaporator Subcooling Calculation Worksheet

	Circuit 1
Refrigerant Type	
1. Ambient Temperature	
2. Condenser Elevation	
3. Condenser Elevation Temperature Correction	
4. Liquid Line Pressure	
5. Liquid Pressure converted to Temperature	
6. Measured Liquid Line Temperature	
7. MC Condenser Subcooling Reading	
(Menu ID F50)	

Subtract Line 6 (Measured Line Temperature) from Line 5 (Liquid Pressure converted to Temperature) to obtain Calculated Subcooling.

	Circuit 1
Line 5	
Line 6	
8. Calculated Subcooling	

Elevation Correction

Subtract Line 3 (Correction for Condenser Elevation above Evaporator) from Line 8 (Calculated Subcooling) to obtain Corrected Subcooling.

	Circuit 1
Line 8	
Line 3	
9. Corrected Subcooling	

Verification Against MC Condenser

Subtract Line 7 (MC Condenser Subcooling Reading) from Line 9 (Corrected Subcooling) to obtain Difference.

	Circuit 1
Line 9	
Line 7	
10. Difference	

- If Line 10 (Difference value) is less than ± 3°F, NO charge adjustment is needed.
- If Line 10 (Difference value) is greater than -3°F, add additional charge.
- If Line 10 (Difference value) is greater than +3°F, remove charge.

6.2.4 Air Cooled Liebert MC™ Condensers with Liebert Lee-Temp™ "Flooded Condenser" Head Pressure Control System

The Liebert Lee-Temp system consists of a modulating type head pressure control valve and insulated receiver with heater pad to ensure operation at ambient temperatures as low as -30°F (-34.4°C). The Liebert Lee-Temp system can be used with any Liebert PDX compressor choice.

Liebert Lee-Temp Piping

A discharge line and liquid line must be field-installed between the indoor unit and the outdoor condenser. See **Figures 21** through **25** for details.

Liebert Lee-Temp™-Controlled Materials Supplied

- Built-in, pre-wired condenser control box
- Air-Cooled condenser
- Piping access cover
- Bolts—four per leg (3/8" x 5/8")
- Terminal block for two-wire, 24V interlock connection between unit and condenser
- Condenser legs—four with one-fan units and six on two-fan units
- Bolts—six per receiver (3/8" x 1")
- Liebert Lee-Temp system:
  - Insulated storage receiver—one
  - Head pressure control valve with integral check valve—one
  - Service valve—one
  - Pressure relief valve—one
  - Liquid level sight glass—two
  - Check valve—one

NOTE
Lee-Temp heater pad requires a separate, continuous electrical source. See nameplate on unit for proper voltage.

Lee-Temp Leak Check and Evacuation Procedure

Proper leak check and evacuation can be accomplished only with all system valves open and check valves accounted for.

NOTE
Systems include a factory-installed check valve and an additional downstream Schrader valve with core in the compressor discharge line. Proper evacuation of the condenser side of the compressor can be accomplished only using the downstream Schrader valve. See piping schematics, ***Figures 21*** *through* **25**.

1. If unit power is available, open the unit liquid line solenoid valve using the evacuation function in the diagnostic section of the Liebert iCOM® control. If unit power is not available, a field-supplied 24VAC / 75VA power source must be directly connected to each of the unit solenoid valves.
2. Attach a jumper hose from the service valve fitting on the outlet of the receiver and the Schrader fitting on the discharge header of the condenser. Seat the service valve approximately two (2) turns from the fully back-seated position.
3. Connect refrigerant gauges to the suction rotalock valves and discharge line Schrader valve (see **Note** above) on the compressor.
4. Open the service valves and place a 150 psig (1034kPa) of dry nitrogen with a tracer of refrigerant. Check system for leaks with a suitable leak detector.
5. After completion of leak testing, release the test pressure (per local code) and pull an initial deep vacuum on the system with a suitable pump.
6. After four hours, check the pressure readings and, if they have not changed, break vacuum with dry nitrogen. Pull a second and third vacuum to 500 microns or less. Recheck the pressure after two hours.
7. Remove the jumper hose installed previously from between the service valve fitting and the condenser. After completing this step, proceed to **Liebert Lee-Temp™ Charging**.

Liebert Lee-Temp™ Charging

1. Check unit nameplate for refrigerant type to be used. Unit control configurations differ depending on refrigerant type.
2. Refrigerant charging requires unit operation. Refer to **8.0 - Checklist for Completed Installation**.
3. Calculate the amount of charge for the system. Refer to the unit, condenser and refrigerant line charge data in **Tables 9**, **10** and **11**.
4. Weigh in as much of the system charge as possible before starting the unit.

NOTICE

Risk of improper refrigerant charging. Can cause equipment damage.

Refrigerant R410A is a blended refrigerant and must be introduced and charged from the cylinder only as a liquid.

When adding liquid refrigerant to an operating system, it may be necessary to add the refrigerant through the compressor suction service valve. Care must be exercised to avoid damage to the compressor. Emerson recommends connecting a sight glass between the charging hose and the compressor suction service valve. This will permit adjustment of the cylinder hand valve so that liquid can leave the cylinder while allowing vapor to enter the compressor.

5. Turn on unit disconnect switch. Operate the unit for 30 minutes using the charging function in the diagnostic section of the Liebert iCOM®. The charging function operates the compressor at full capacity and energizes the blower motor and liquid line solenoid valve. The reheat and humidifier are disabled. A minimum 20psig (138kPa) must established and maintained for the compressor to operate. The charging function can be reset as many times as required to complete unit charging.
6. Charge the unit until the liquid line sight glass becomes clear. Then add one additional pound (0.45 kg) of refrigerant.

NOTE

A digital scroll compressor will have a clear sight glass only when operating at 100% capacity. When operating below 100%, the sight glass may show bubbles with each 15-second unloading cycle.

Liebert Lee-Temp Receiver Refrigerant Level

On the receiver at the condenser are two refrigerant-level sight glasses. Refrigerant level will vary with outside temperature. Check refrigerant level after the unit has been on for at least 15 minutes.

Sight Glass Levels

40°F (4.5°C) and lower—bottom sight glass is 3/4 full

40 to 60°F (4.5 to 15.5°C)—bottom sight glass is full

60°F (15.5°C) and higher—top sight glass is 3/4 full

6.3 Fluid Connections for Systems Using Water/Glycol and Chilled Water

These guidelines apply to field leak checking and fluid requirements for field piping systems, including Liebert chilled water, hot water, condenser (water or glycol), GLYCOOL and drycooler circuits.

General Guidelines

- Equipment damage and personal injury can result from improper piping installation, leak checking, fluid chemistry and fluid maintenance.
- Follow local piping codes, safety codes.
- Qualified personnel must install and inspect system piping.
- Contact a local water consultant regarding water quality, corrosion protection and freeze protection requirements.
- Install manual shutoff valves at the supply and return line to each indoor unit and drycooler to permit routine service and emergency isolation of the unit.
- Install a 16-20 mesh strainer on the water/glycol supply to the Liebert PDX water/glycol or GLYCOOL units. The strainer is needed to prevent particles in the water from entering the unit's heat exchanger.

NOTICE

Risk of frozen fluids. Can cause equipment damage and building damage.

Freezing system fluids can rupture piping. Complete system drain-down cannot be ensured. When the field piping or unit may be exposed to freezing temperatures, charge the system with the proper percentage of glycol and water for the coldest design ambient.

Automotive antifreeze is unacceptable and must NOT be used in any glycol fluid system.

NOTICE

Risk of corrosion. Can cause equipment damage.

Read and follow individual unit installation instructions for precautions regarding fluid system design, material selection and use of field-provided devices. Liebert systems contain iron and copper alloys that require appropriate corrosion protection.

Contact a water consultant about water quality, corrosion and freeze protection requirements.

Water chemistry varies greatly by location, as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components. The chemistry of the water used must be considered, because water from some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Preferably, surface waters that are classified as soft and are low in chloride and sulfate ion content should be employed. Proper inhibitor maintenance must be performed to prevent corrosion of system components. Consult glycol manufacturer for testing and maintenance of inhibitors.

Commercial ethylene glycol, when pure, is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the water from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

NOTICE

Risk of no-flow condition. Can cause fluid leaks from tubing and piping corrosion resulting in expensive equipment and building damage.

Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched ON and system pump operating.

Leak Checking of Unit and Field Piping

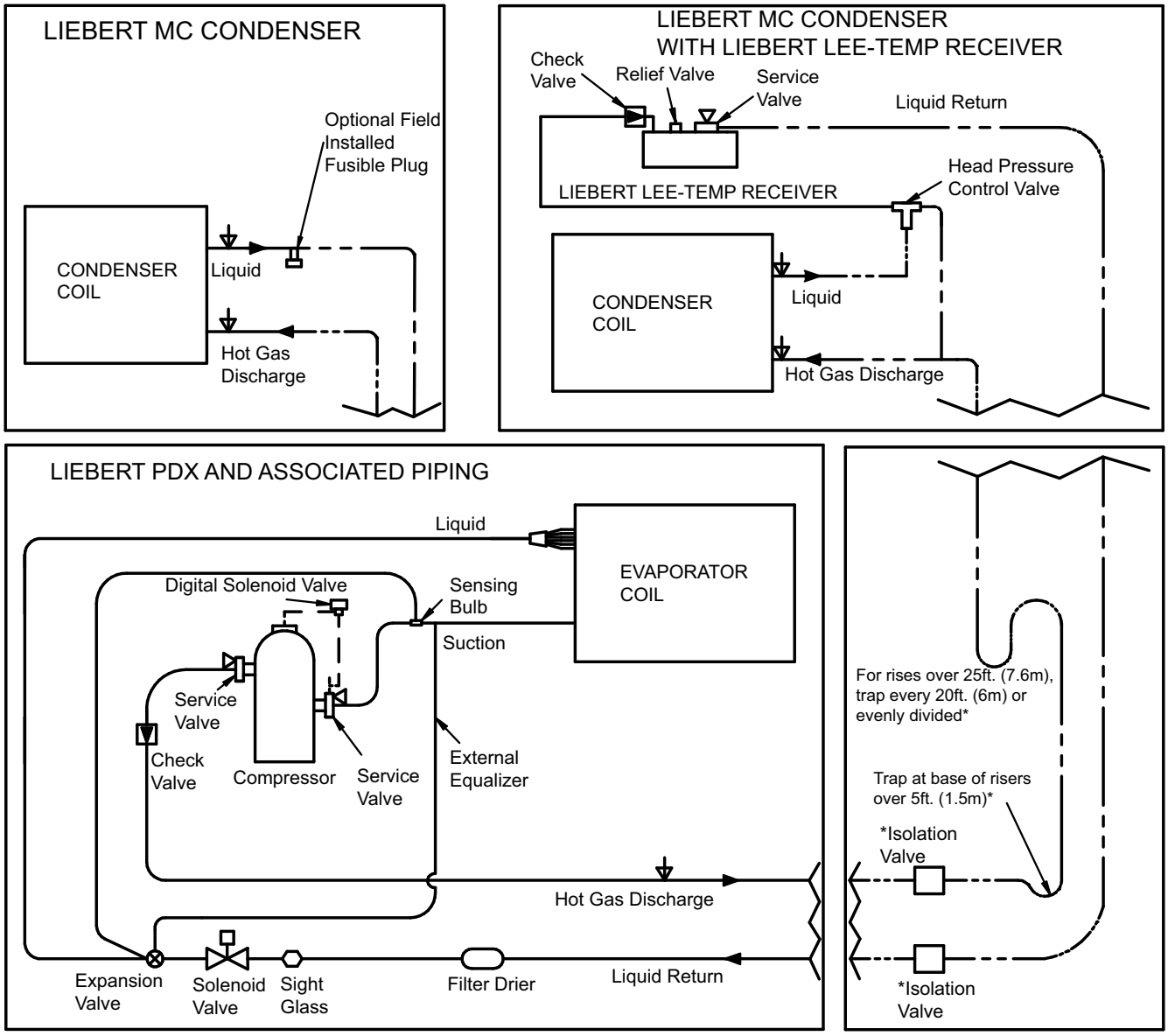
Liebert unit fluid systems are factory-checked for leaks and may be shipped with a nitrogen holding charge. Liebert unit fluid circuits should be checked for leaks at installation as described below.

NOTE

Emerson recommends isolating the unit be isolated with field-installed shutoff valves during leak checking of field-installed piping. When the Liebert units are included in a leak test, use of fluid for pressure testing is recommended. When pressurized gas is used for leak testing the Liebert unit, the maximum recommended pressure is 30 psig (207kPa) and tightness of the unit should be verified by pressure decay over time, (<2 psig/hour [13.8kPa/hour]) or sensing a tracer gas with suitable instrumentation. Dry seals in fluid valves and pumps may not hold a high gas pressure.

7.0 PIPING SCHEMATICS

Figure 21 Piping schematic—Air-cooled models



Refrigerant Piping

Field Piping

Service / Schrader (Access) Connection No Valve Core

Service / Schrader (Access) Connection With Valve Core

Schematic representation shown. Do not use for specific connection locations.

* Components are not supplied by Emerson but are required for proper circuit operation and maintenance

DPN002929
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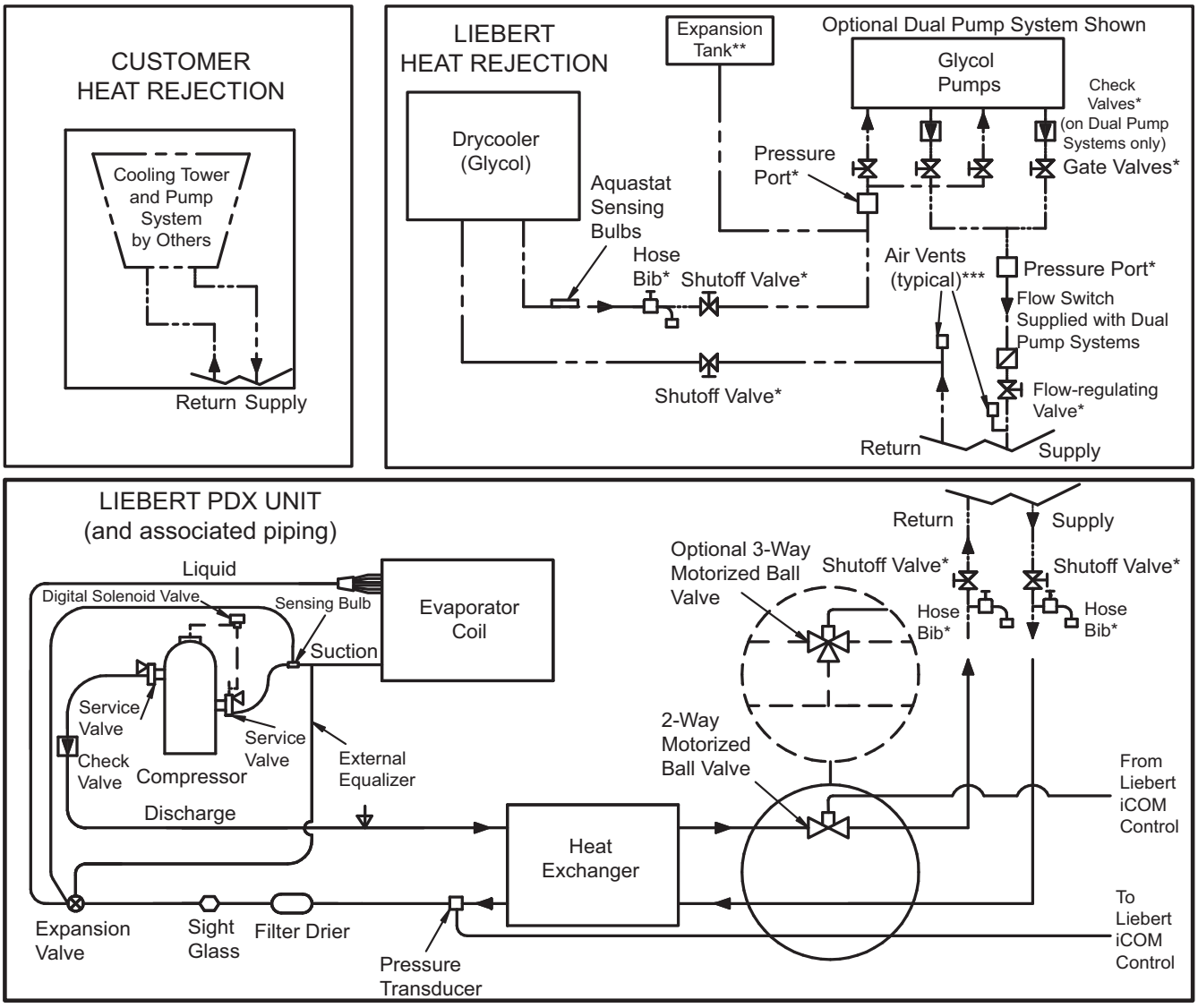
Figure 22 Piping schematic—Water/glycol models

For systems with drycoolers, refer to 10.15 - Drycooler Settings.



Factory Piping
Field Piping
Optional Factory Piping

Service / Schrader (Access) Connection No Valve Core
Service / Schrader (Access) Connection with Valve Core

* Components are not supplied by Emerson but are requird for proper circuit operation and maintenance
** Field installed at highest point in system on return line to pumps
*** Locate at tops of all risers and any intermediate system high points

DPN002931
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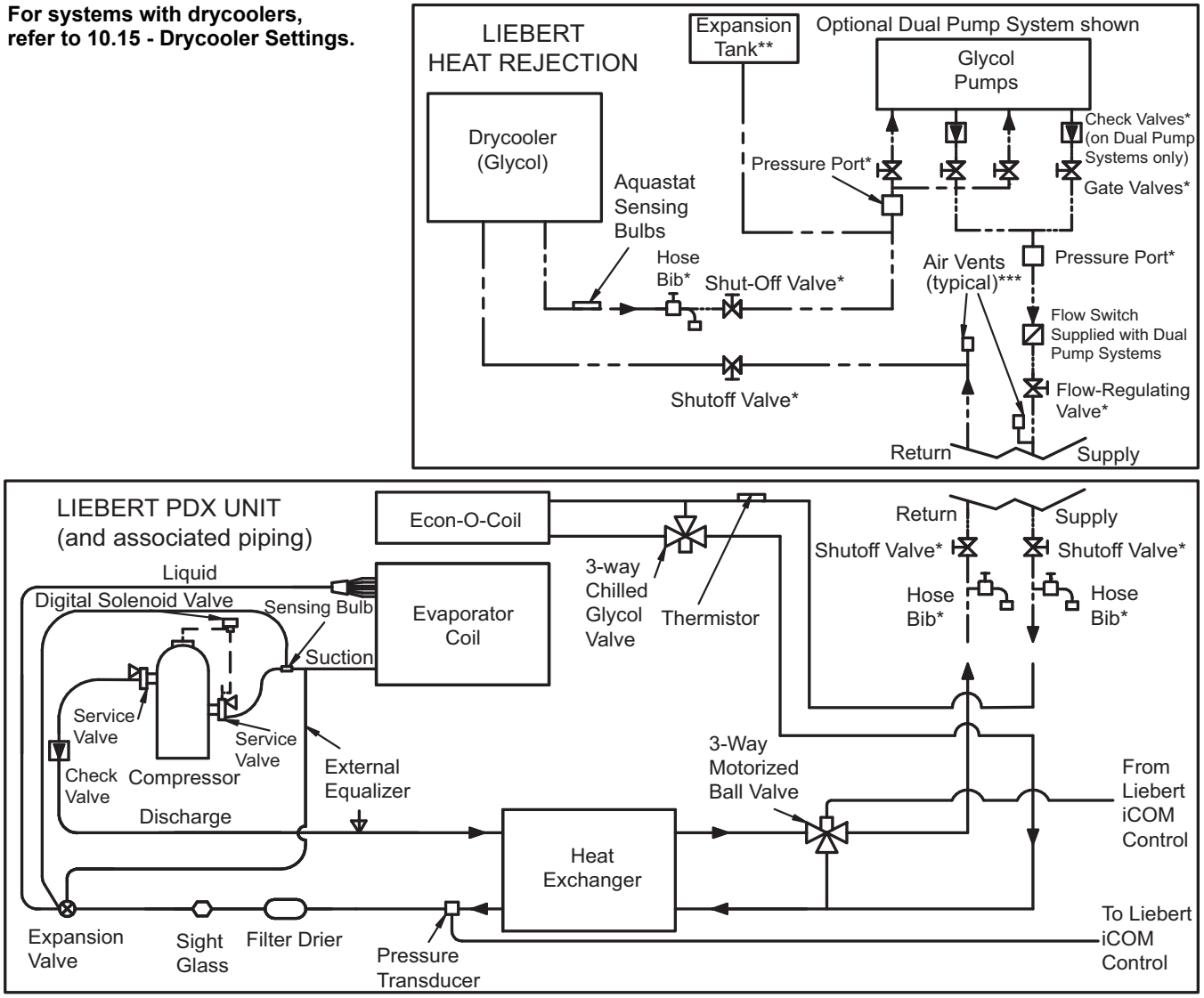
NOTE: Schematic representation shown.This schematic does not imply or define elevations and component location, unless specifically noted.

Figure 23 Piping schematic—GLYCOOL models

For systems with drycoolers, refer to 10.15 - Drycooler Settings.



Factory Piping

Field Piping

Service / Schrader (access) connection no valve core

Service / Schrader (access) connection with valve core

NOTE: Schematic representation shown. This schematic does not imply or define elevations and component location, unless specifically noted.

* Components are not supplied by Emerson but are required for proper circuit operation and maintenance

** Field-installed at highest point in system on return line to pumps

*** Locate at tops of all risers and any intermediate system high points

DPN002932
Rev. 1

Figure 24 Piping schematic, chilled water units

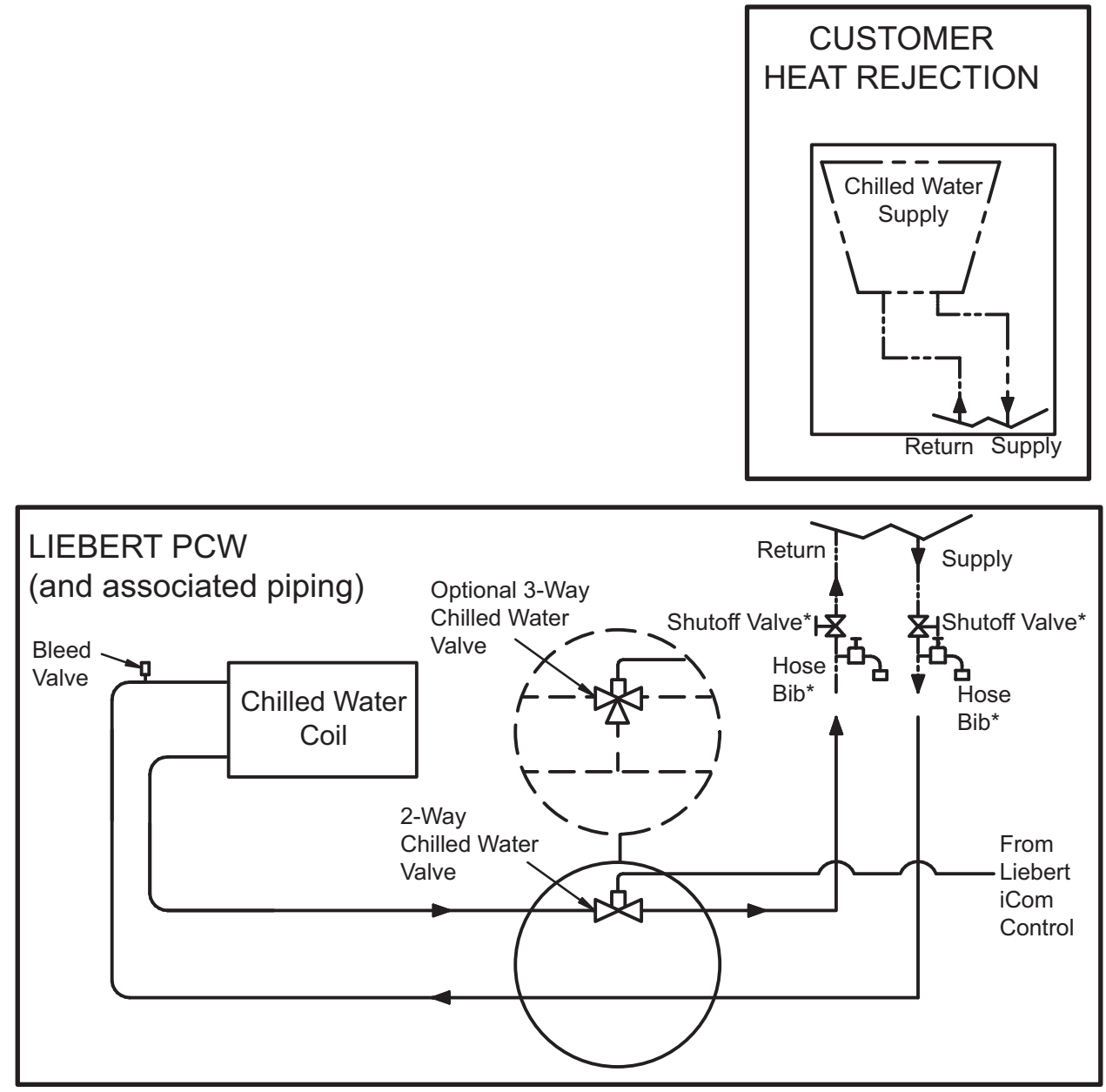
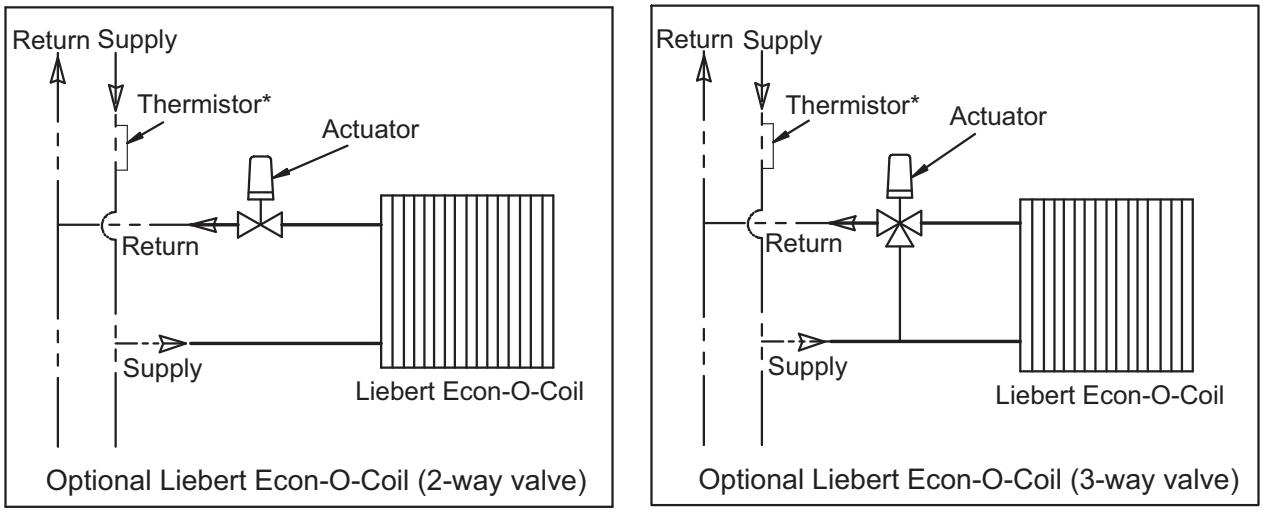


Figure 25 Optional piping schematic for Econ-O-Coil



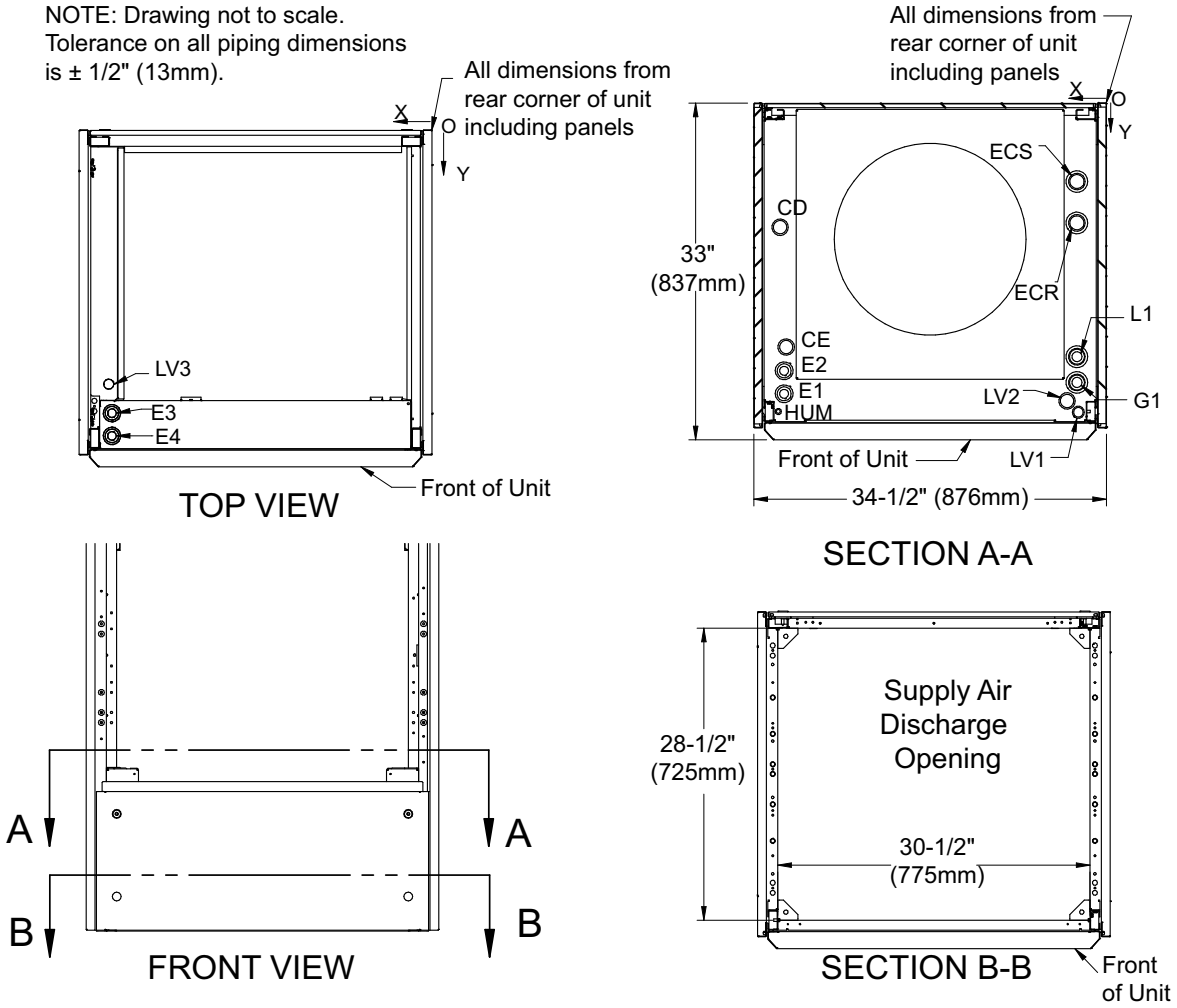
* Supplied with 10 ft. (3m) extra thermistor wire for installation on field supply line.

1) Place thermistor in location where flow is always present.
2) Thermistor must be located out of the supply air stream.

Factory Piping
Field Piping

DPN002972
Rev. 0

Figure 26 Primary connection locations—Liebert PDX downflow, air-cooled models



* Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.

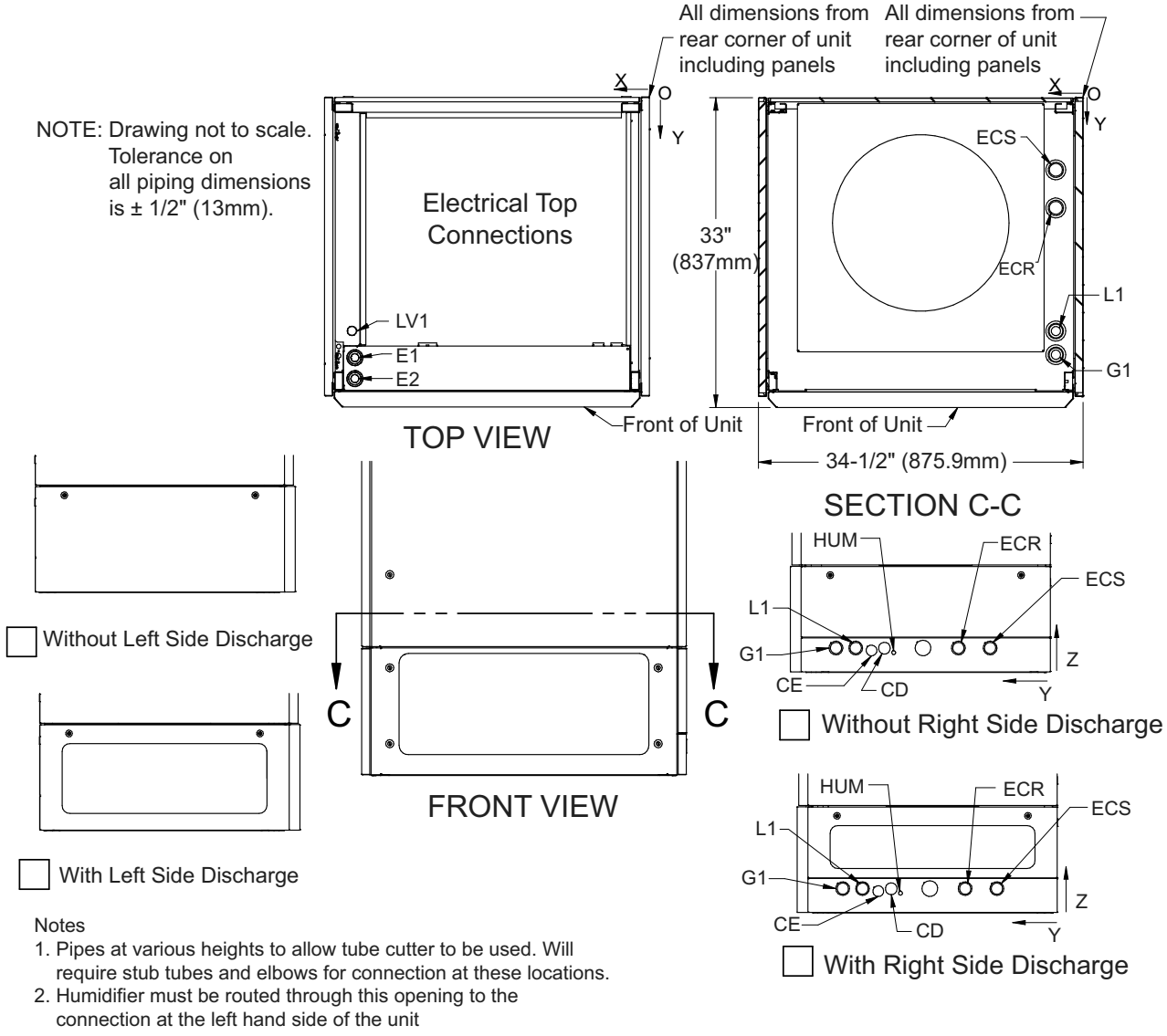
** Supplied on dual cooling systems only (4 pipe system).

DPN002938
Rev. 2

Point	Description	X, in. (mm)	Y, in. (mm)	Connection Size/Opening, in.	
				PX018, PX023	PX029
L1	Liquid Line System	2-7/8 (73)	24-3/4 (630)	1/2"	5/8"
G1	Hot Gas Discharge	2-7/8 (73)	27-3/8 (694)	5/8"	7/8"
CD	Condensate Drain*	32 (811)	12-1/8 (309)	3/4	
CE	Condensate Electrical	31-1/4 (796)	23-3/4 (606)	1-1/2	
HUM	Humidifier Supply Line	32 (815)	30-1/8 (766)	1/4	
ECS	Econ-O-Coil Supply**	2-7/8 (73)	7-5/8 (195)	1-1/8	
ECR	Econ-O-Coil Return**	2-7/8 (73)	11-3/4 (298)	1-1/8	
E1	Electrical Connection (High-Voltage) Bottom	31-1/2 (801)	28-3/8 (722)	7/8, 1-3/8, 1-3/4	
E2	Electrical Connection (High-Voltage) Bottom	31-1/2 (801)	26-1/8 (665)	7/8, 1-3/8, 1-3/4	
E3	Electrical Connection (High-Voltage) Top	31 (788)	27-3/4 (704)	7/8, 1-3/8, 1-3/4	
E4	Electrical Connection (High-Voltage) Top	31 (788)	30 (760)	7/8, 1-3/8, 1-3/4	
LV1	Electrical Connection (Low-Voltage) Bottom	2-3/4 (70)	30-1/4 (768)	1-1/8	
LV2	Electrical Connection (Low-Voltage) Bottom	3-7/8 (98)	29-1/8 (740)	1-1/2	
LV3	Electrical Connection (Low-Voltage) Top	31-5/8 (802)	24-7/8 (631)	1	

Source: DPN002938, Rev. 2

Figure 27 Primary connection locations—Liebert PDX downflow, air-cooled, front discharge models



Notes
1. Pipes at various heights to allow tube cutter to be used. Will require stub tubes and elbows for connection at these locations.
2. Humidifier must be routed through this opening to the connection at the left hand side of the unit

* Field-pitch condensate drain line a minimum of 1/8" (3.2mm) per foot (305mm). All units contain a factory-installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials.The drain line must comply with all local codes.

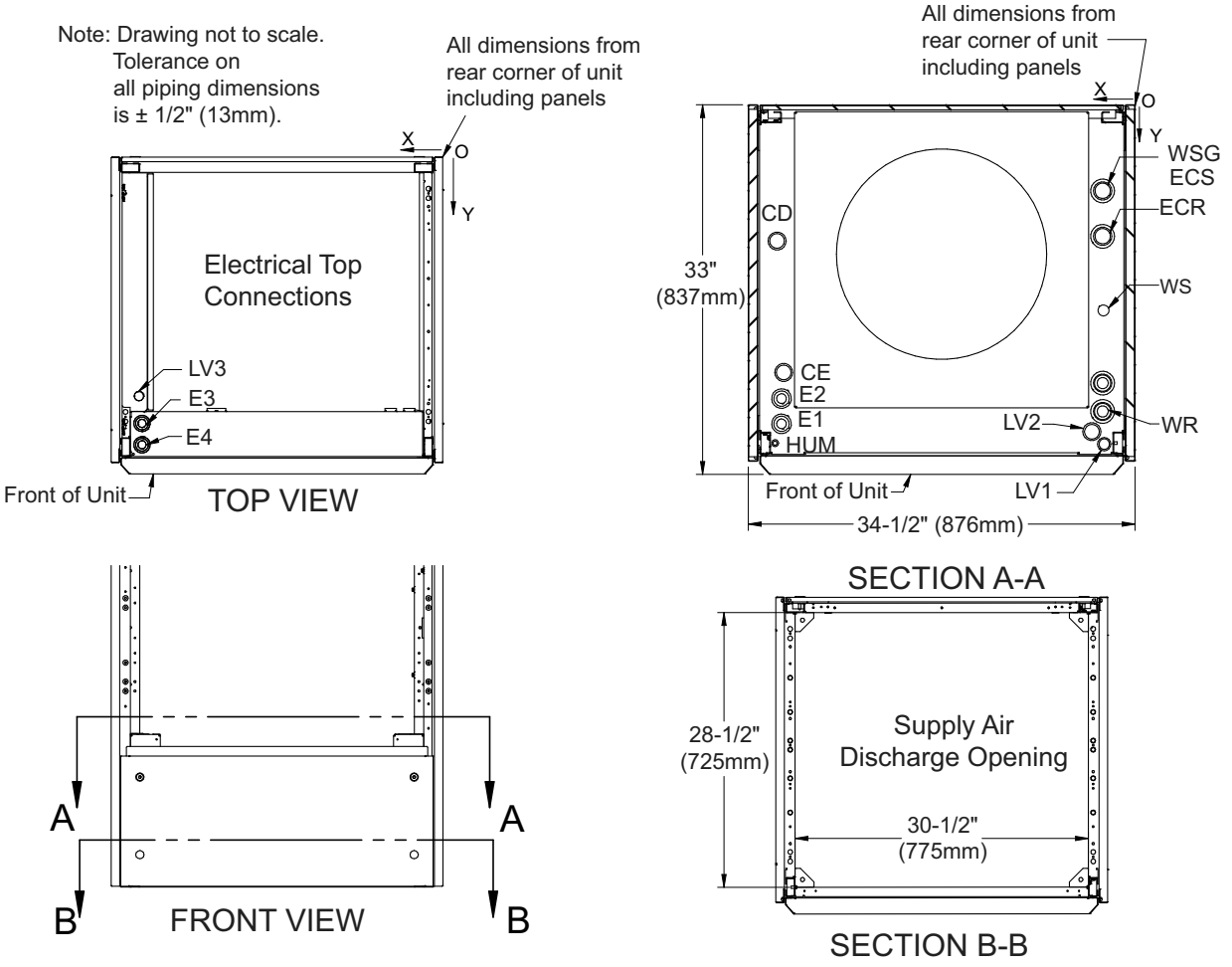
** Supplied on dual cooling systems only (4 pipe system).

DPN002945
Rev. 0

Point	Description	X, in. (mm)	Y, in. (mm)	Z, in. (mm)	Connection Size/Opening, in.	
					PDX018, PX023	PDX029
L1	Liquid Line System	2-7/8 (73)	24-3/4 (630)	3 (76)	1/2"	5/8"
G1	Hot Gas Discharge	2-7/8 (73)	27-3/8 (694)	3 (76)	5/8"	7/8"
CD	Condensate Drain*	—	12-1/8 (309)	3 (76)	3/4	
CE	Condensate Electrical	—	23-3/4 (606)	2-3/4 (70)	1-3/8"	
HUM	Humidifier Supply Line	—	30-1/8 (766)	2-1/2 (64)	1/4	
ECS	Econ-O-Coil Supply **	2-7/8 (73)	7-5/8 (195)	3 (76)	1-1/8	
ECR	Econ-O-Coil Return **	2-7/8 (73)	11-3/4 (298)	3 (76)	1-1/8	
E1	Electrical Connection (High-Voltage) Top	31 (788)	27-3/4 (704)	—	7/8, 1-3/8, 1-3/4	
E2	Electrical Connection (High-Voltage) Top	31 (788)	30 (760)	—	7/8, 1-3/8, 1-3/4”	
LV1	Electrical Connection (Low-Voltage) Top	31-5/8 (802)	24-7/8 (699)	—	1	

Source: DPN002945, Rev. 0

Figure 28 Primary connection locations, Liebert PDX downflow, water/glycol/GLYCOOL-cooled models



* Field-pitch condensate drain line a minimum of 1/8" (3.2mm) per foot (305mm). All units contain a factory-installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.

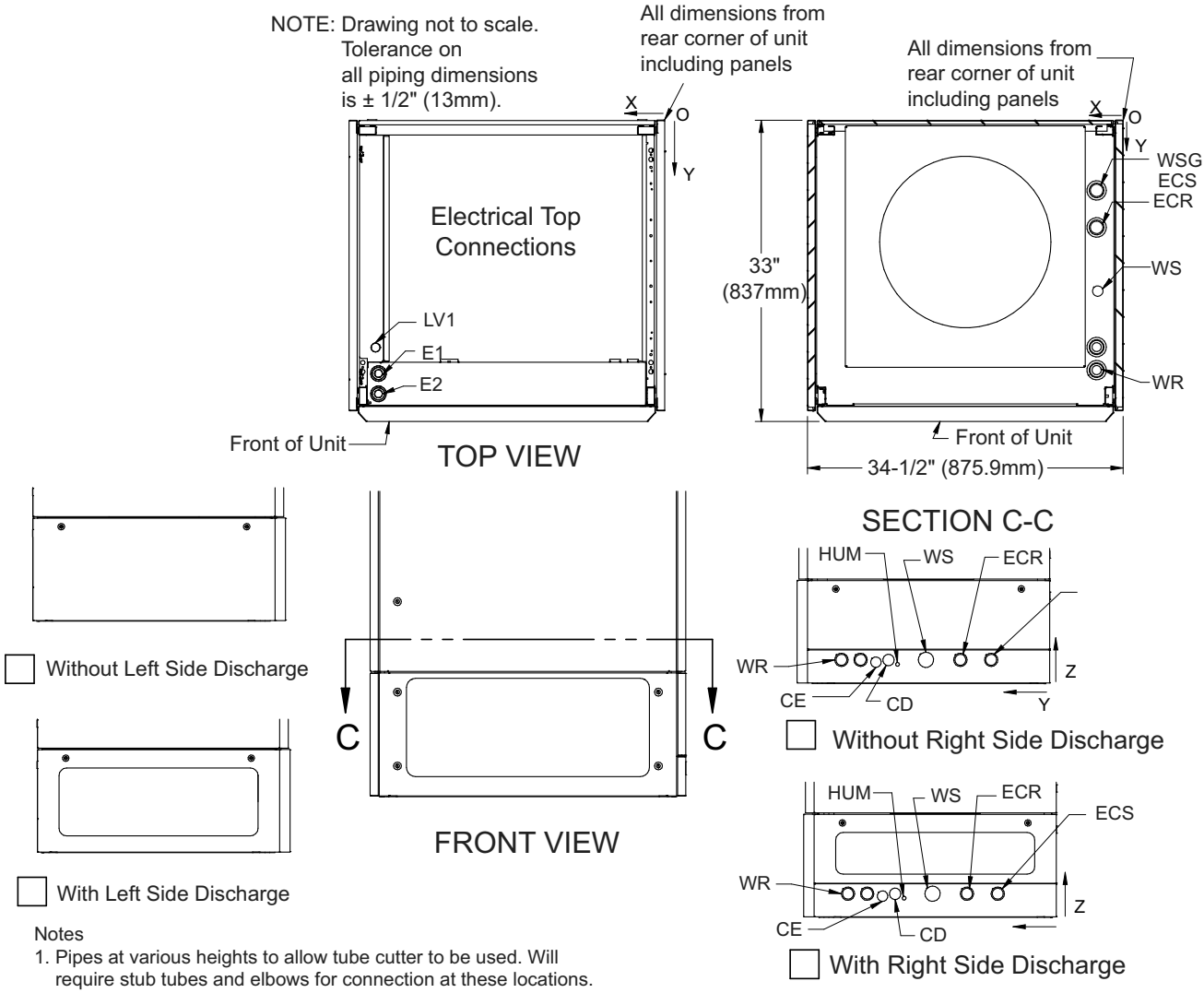
** Supplied on dual cooling systems only (four-pipe system)

DPN002942
Rev. 1

Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening, in.
WS	Water/Glycol Supply	2-7/8 (73)	16-1/4 (413)	1-1/8
WR	Water/Glycol/GLYCOOL Return	2-7/8 (73)	27-3/8 (694)	1-1/8
WSG	GLYCOOL Supply	2-7/8 (73)	7-5/8 (195)	1-1/8
CD	Condensate Drain*	32 (811)	12-1/8 (309)	3/4
CE	Condensate Electrical	31-1/4 (796)	23-3/4 (606)	1-1/2
HUM	Humidifier Supply Line	32 (815)	30-1/8 (766)	1/4
ECS	Econ-O-Coil Supply **	2-7/8 (73)	7-5/8 (195)	1-1/8
ECR	Econ-O-Coil Return **	2-7/8 (73)	11-3/4 (298)	1-1/8
E1	Electrical Connection (High-Voltage) Bottom	31-1/2 (801)	28-3/8 (722)	7/8, 1-3/8, 1-3/4
E2	Electrical Connection (High-Voltage) Bottom	31-1/2 (801)	26-1/8 (665)	7/8, 1-3/8, 1-3/4
E3	Electrical Connection (High-Voltage) Top	31 (788)	27-3/4 (704)	7/8, 1-3/8, 1-3/4
E4	Electrical Connection (High-Voltage) Top	31 (788)	30 (760)	7/8, 1-3/8, 1-3/4
LV1	Electrical Connection (Low-Voltage) Bottom	2-3/4 (70)	30-1/4 (768)	1-1/8
LV2	Electrical Connection (Low-Voltage) Bottom	3-7/8 (98)	29-1/8 (740)	1-1/2
LV3	Electrical Connection (Low-Voltage) Top	31-5/8 (802)	24-7/8 (631)	1

Source: DPN002942, Rev. 1

Figure 29 Primary connection locations, Liebert PDX downflow water/glycol/GLYCOOL, front discharge models



Notes
1. Pipes at various heights to allow tube cutter to be used. Will require stub tubes and elbows for connection at these locations.
2. Humidifier must be routed through this opening to the connection at the left hand side of the unit.

* Field-pitch condensate drain line a minimum of 1/8" (3.2mm) per foot (305mm). All units contain a factory-installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials.The drain line must comply with all local codes.

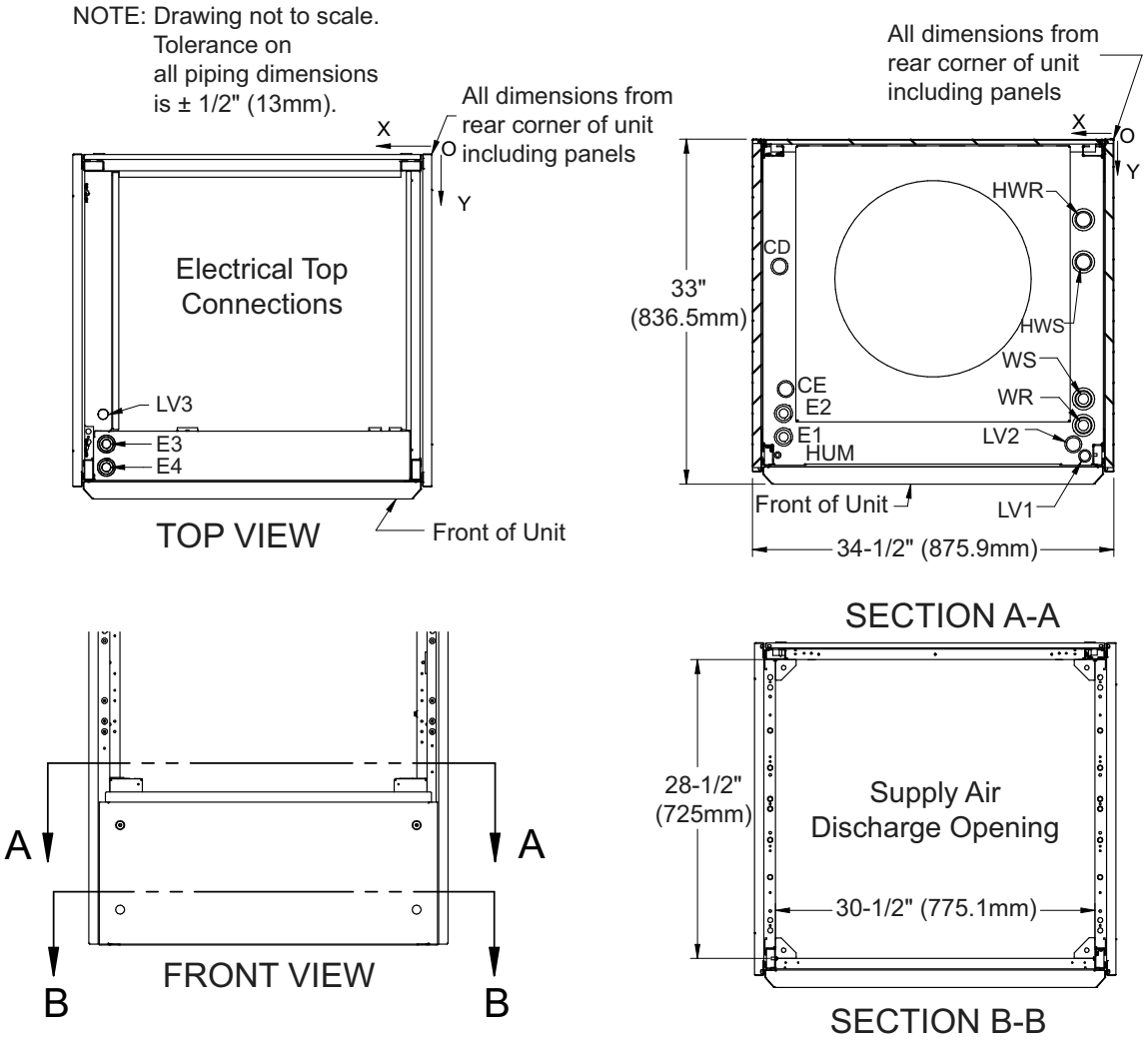
** Supplied on dual cooling systems only (four-pipe system)

DPN002947
Rev. 1

Point	Description	X, in. (mm)	Y, in. (mm)	Z, in. (mm)	Connection Size / Opening, in.
WS	Water/Glycol Supply	2-7/8 (74)	16-1/4 (413)	3 (76)	1-1/8
WR	Water/Glycol/GLYCOOL Return	2-7/8 (73)	27-3/8 (694)	3 (76)	1-1/8
WSG	Glycool Supply	2-7/8 (73)	7-5/8 (195)	3 (76)	1-1/8
CD	Condensate Drain*	—	21-1/8 (537)	3 (76)	3/4
CE	Condensate Electrical	—	22-3/4 (578)	2-3/4 (70)	1-3/8
HUM	Humidifier Supply Line	—	20 (508)	2-1/2 (64)	1/4
ECS	Econ-O-Coil Supply **	2-7/8 (73)	7-5/8 (195)	3 (76)	1-1/8
ECR	Econ-O-Coil Return **	2-7/8 (73)	11-3/4 (298)	3 (76)	1-1/8
E1	Electrical Conn. (High-Voltage) Top	31 (787)	27-3/4 (705)	—	7/8, 1-3/8, 1-3/4
E2	Electrical Conn. (High-Voltage) Top	31 (787)	30 (762)	—	7/8, 1-3/8, 1-3/4
LV1	Electrical Conn. (Low-Voltage) Top	31-5/8 (805)	24-7/8 (632)	—	1-1/8

Source: DPN002947, Rev. 1

Figure 30 Primary connection locations, Liebert PCW chilled water downflow models



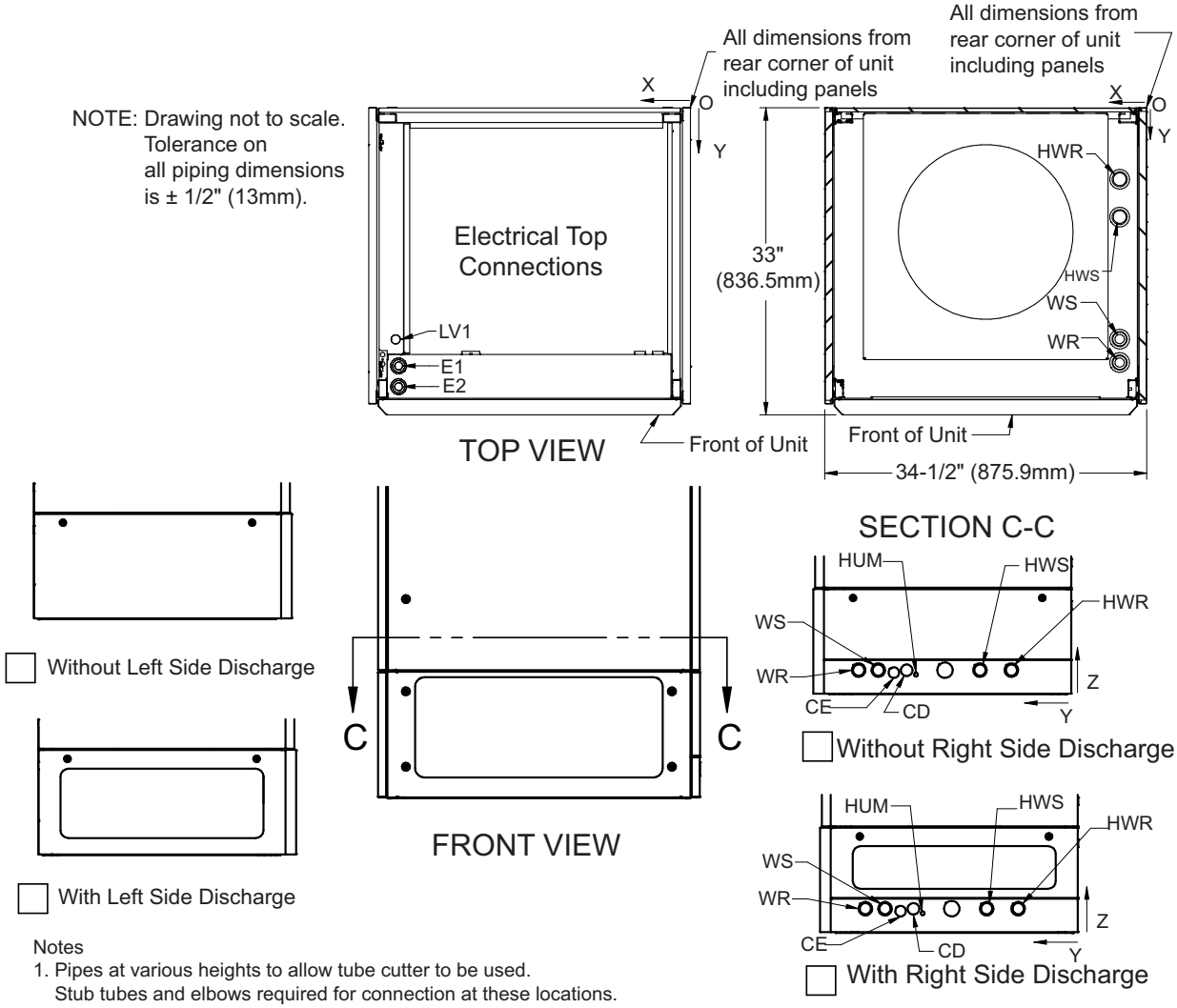
* Field-pitch condensate drain line a minimum of 1/8" (3.2mm) per foot (305mm). All units contain a factory-installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.

DPN002940
Rev. 1

Point	Description	X, in. (mm)	Y	Connection Size / Opening
HWR	Hot Water Reheat Return (Optional)	2-7/8 (73)	7-5/8 (195)	5/8
HWS	Hot Water Reheat Supply (Optional)	2-7/8 (73)	11-3/4 (298)	5/8
WS	Water Supply	2-7/8 (73)	7-5/8 (195)	1-1/8
WR	Water Return	2-7/8 (73)	11-3/4 (298)	1-1/8
CD	Condensate Drain*	32 (815)	12-1/8 (309)	3/4
CE	Condensate Electrical	31-1/4 (796)	23-3/4 (606)	1-1/2
HUM	Humidifier Supply Line	32 (815)	30-1/8 (766)	1/4
E1	Electrical Connection (High-Voltage) Bottom	31-1/2 (801)	28-3/8 (722)	7/8, 1-3/8, 1-3/4
E2	Electrical Connection (High-Voltage) Bottom	31-1/2 (801)	26-1/8 (665)	7/8, 1-3/8, 1-3/4
E3	Electrical Connection (High-Voltage) Top	31 (788)	27-3/4 (704)	7/8, 1-3/8, 1-3/4
E4	Electrical Connection (High-Voltage) Top	31 (788)	30 (760)	7/8, 1-3/8, 1-3/4
LV1	Electrical Connection (Low-Voltage) Bottom	2-3/4 (70)	30-1/4 (768)	1-1/8
LV2	Electrical Connection (Low-Voltage) Bottom	3-7/8 (98)	29-1/8 (740)	1-1/2
LV3	Electrical Connection (Low-Voltage) Top	31-5/8 (802)	24-7/8 (631)	1

Source: DPN002940, Rev. 1

Figure 31 Primary connection locations, Liebert PCW downflow, front discharge



Notes
1. Pipes at various heights to allow tube cutter to be used.
   Stub tubes and elbows required for connection at these locations.
2. Humidifier must be routed through this opening to the
   connection at the left hand side of the unit

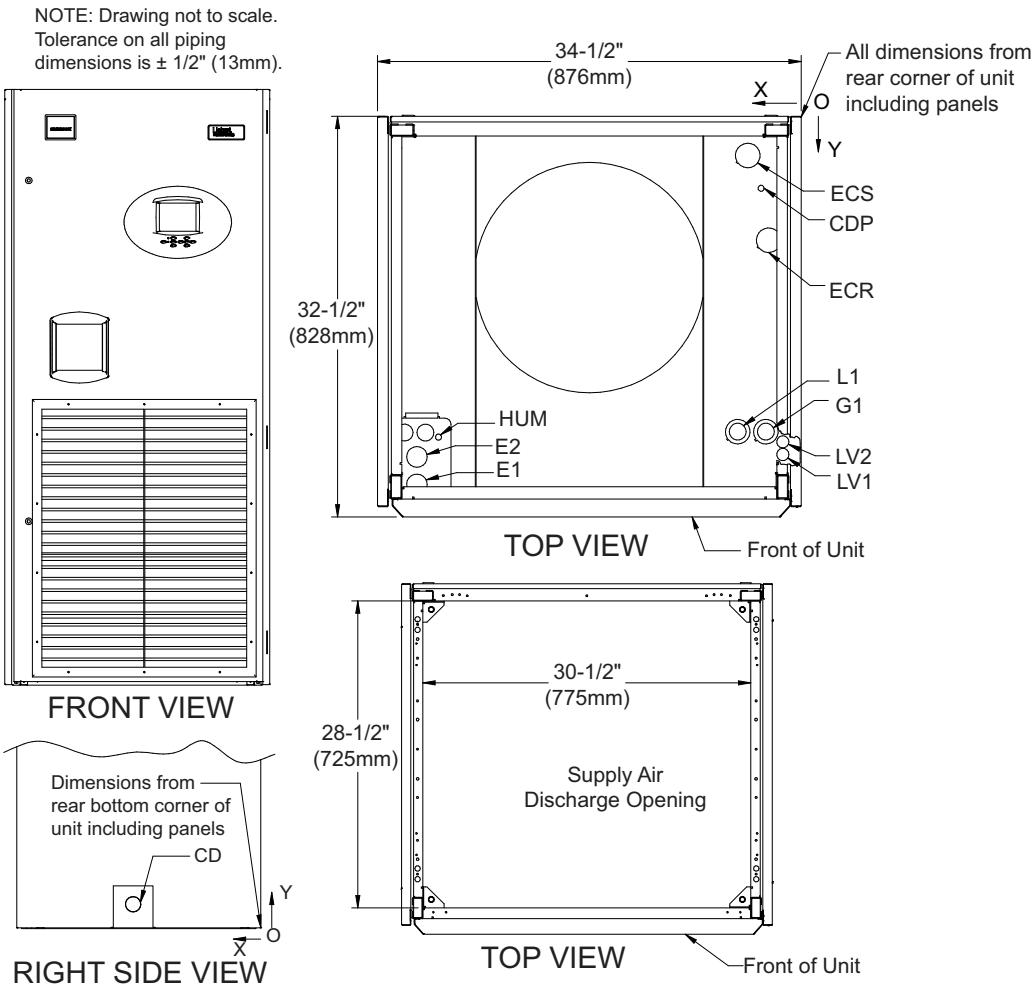
* Field-pitch condensate drain line a minimum of 1/8" (3.2mm) per foot (305mm). All units contain a factory-installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials.The drain line must comply with all local codes.

DPN002946
Rev. 0

Point	Description	X, in. (mm)	Y, in. (mm)	Z, in. (mm)	Connection Size / Opening, in.
HWR	Hot Water Reheat Return (Optional)	2-7/8 (73)	7-5/8 (195)	3 (76)	5/8
HWS	Hot Water Reheat Supply (Optional)	2-7/8 (73)	11-3/4 (298)	3 (76)	5/8
WS	Water Supply	2-7/8 (73)	24-3/4 (629)	3 (76)	1-1/8
WR	Water Return	2-7/8 (73)	27-3/8 (695)	3 (76)	1-1/8
CD	Condensate Drain*	—	21-1/8 (537)	3 (76)	3/4
CE	Condensate Electrical	—	22-3/4 (606)	2-3/4 (70)	1-1/2
HUM	Humidifier Supply Line	—	20 (508)	2-1/2 (64)	1/4
E1	Electrical Conn. (High-Voltage) Top	31 (788)	27-3/4 (704)	—	7/8, 1-3/8, 1-3/4
E2	Electrical Conn. (High-Voltage) Top	31 (788)	30 (760)	—	7/8, 1-3/8, 1-3/4
LV1	Electrical Conn. (Low-Voltage) Top	31-5/8 (802)	24-7/8 (631)	—	1

Source: DPN00294, Rev. 0

Figure 32 Primary connection locations, Liebert PDX air-cooled upflow models



* Field pitch condensate drain line a minimum of 1/8" (3.2mm) per foot (305mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.

** Supplied on dual-cooling systems only.

*** Unit with front return shown. Bottom return with rear return floor stand also available.

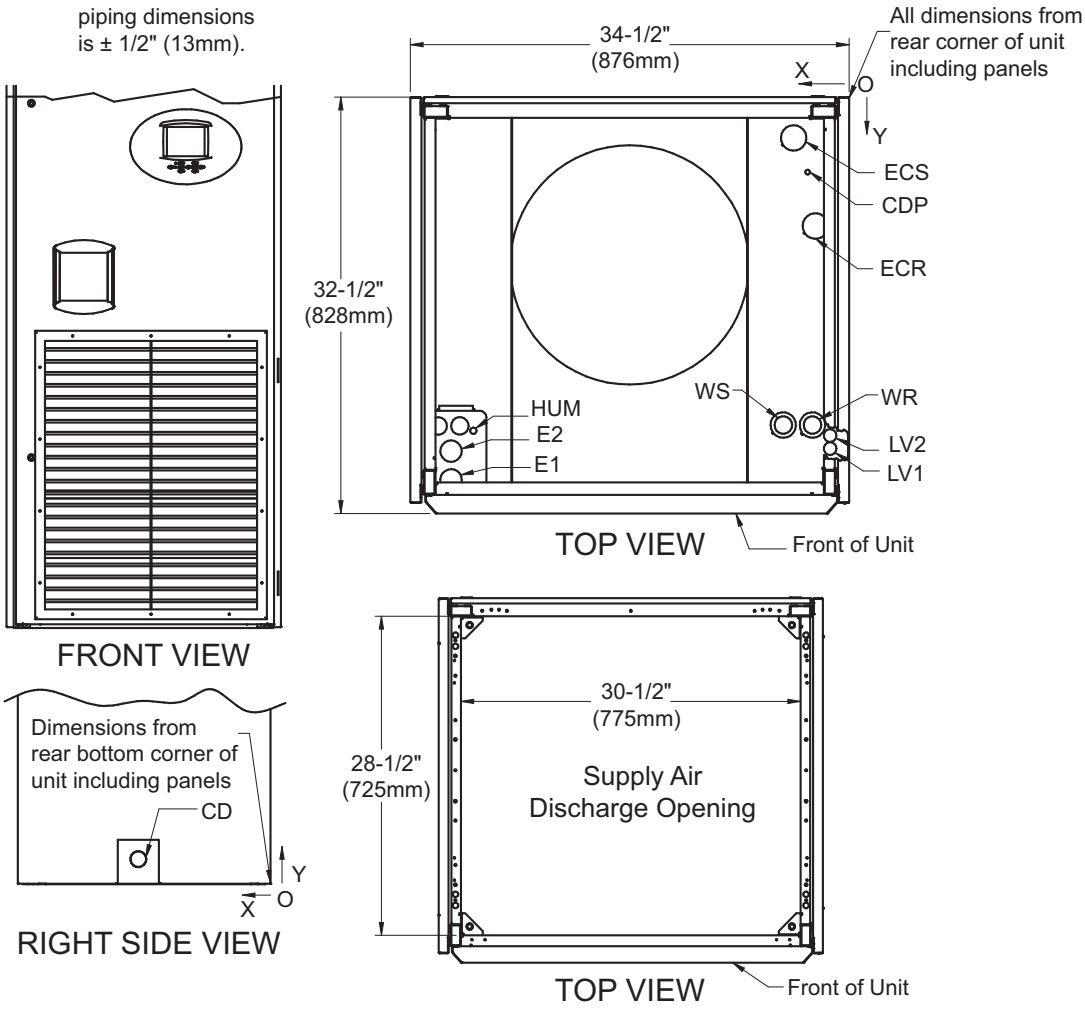
DPN002939
Rev. 1

Point	Description	X, in. (mm)	Y, in. (mm)	Connection Size/Opening, in.	
				PX018, PX023	PX029
L1	Liquid Line System	1 5-1/8 (131)	25-5/8 (652)	1/2"	5/8"
G1	Hot Gas Discharge	1 2-7/8 (73)	25-5/8 (652)	5/8"	7/8"
CD	Condensate Drain*	16-5/8 (422)	3-1/4 (80)	3/4 FPT	
CDP	Condensate Drain with Pump	3-1/4 (83)	5-7/8 (149)	1/2"	
HUM	Humidifier Supply Line	29-1/2 (750)	26 (663)	1/4	
ECS	Econ-O-Coil Supply **	4-1/4 (111)	3-1/4 (81)	1-1/8	
ECR	Econ-O-Coil Return **	2-5/8 (67)	10 (256)	1-1/8	
E1	Electrical Connection (High-Voltage)	31-1/4 (794)	30 (761)	7/8, 1-3/8, 1-3/4	
E2	Electrical Connection (High-Voltage)	31-1/4 (794)	27-3/4 (702)	7/8, 1-3/8, 1-3/4”	
LV1	Electrical Connection (Low-Voltage)	1-1/2 (38)	27-1/2 (699)	1	
LV2	Electrical Connection (Low-Voltage)	1-1/2(38)	26-1/2 (673)	1	

Source: DPN002939, Rev. 1

Figure 33 Primary connection locations, Liebert PDX upflow, water/glycol/GLYCOOL models

NOTE: Drawing not to scale.
Tolerance on all piping dimensions is ± 1/2" (13mm).



* Field-pitch condensate drain line a minimum of 1/8" (3.2mm) per foot (305mm). All units contain a factory-installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials.The drain line must comply with all local codes.

** Supplied on dual cooling systems only (4 pipe system)

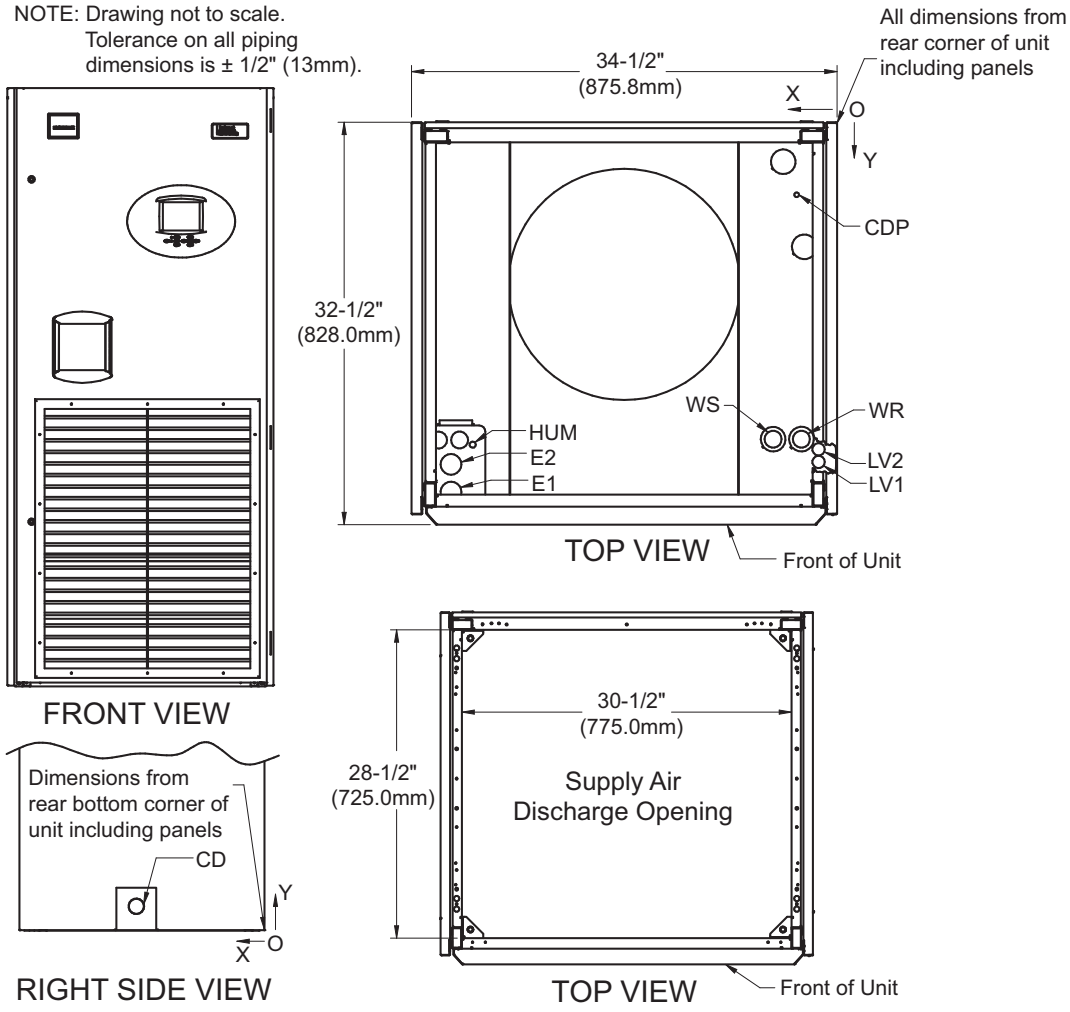
*** Unit with front return shown. Bottom return with rear return floor stand also available.

DPN002943
Rev 0

Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening, in.
WS	Water/Glycol/GLYCOOL	5-1/8 (74)	25-5/8 (297)	1-1/8
WR	Water/Glycol/GLYCOOL Return	2-7/8 (73)	25-5/8 (652)	1-1/8
CD	Condensate Drain*	16-5/8 (422)	3-1/4 (80)	3/4 FPT
CDP	Condensate Drain With Pump	3-1/4 (83)	5-7/8 (149)	1/2
HUM	Humidifier Supply Line	29-1/2 (750)	26 (663)	1/4
ECS	Econ-O-Coil Supply **	4-1/4' (111)	3-1/4 (81)	1-1/8
ECR	Econ-O-Coil Return **	2-5/8 (67)	10 (256)	1-1/8
E1	Electrical Connection (High-Voltage)	31-1/4 (794)	30 (761)	7/8, 1-3/8, 1-3/4
E2	Electrical Connection (High-Voltage)	31-1/4 (794)	27-3/4 (702)	7/8, 1-3/8, 1-3/4
LV1	Electrical Connection (Low-Voltage)	1-1/2 (38)	27-1/2 (699)	1
LV2	Electrical Connection (Low-Voltage)	1-1/2 (38)	26-1/2 (673)	1

Source: DPN002943, Rev. 0

Figure 34 Primary connection locations, Liebert PCW chilled water upflow models



* Field-pitch condensate drain line a minimum of 1/8" (3.2mm) per foot (305mm). All units contain a factory-installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.

** Unit with front return shown. Bottom return with rear return floor stand also available.

DPN002941
Rev. 0

Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening, in.
WS	Water Supply	5-1/8 (131)	25-5/8 (652)	1-1/8
WR	Water Return	2-7/8 (73)	25-5/8 (652)	1-1/8
CD	Condensate Drain*	16-5/8 (422)	3-1/4 (80)	3/4 FPT
CDP	Condensate Drain With Pump	3-1/4 (83)	5-7/8 (149)	1/2
HUM	Humidifier Supply Line	29-1/2 (750)	26 (663)	1/4
E1	Electrical Connection (High-Voltage)	31-1/4 (794)	30 (761)	7/8, 1-3/8, 1-3/4
E2	Electrical Connection (High-Voltage)	31-1/4 (794)	27-3/4 (702)	7/8, 1-3/8, 1-3/4
LV1	Electrical Connection (Low-Voltage)	1-1/2 (38)	27-1/2 (699)	1
LV2	Electrical Connection (Low-Voltage)	1-1/2 (38)	26-1/2 (673)	1

Source: DPN002941, Rev. 0

8.0 CHECKLIST FOR COMPLETED INSTALLATION

8.1 Moving and Placing Equipment

___ 1. Unpack and check received material.

___ 2. Proper clearance for service access has been maintained around the equipment.

___ 3. Equipment is level and mounting fasteners are tight.

8.2 Electrical

___ 1. Supply voltage and phase matches equipment nameplate.

___ 2. Wiring connections completed between disconnect switch, evaporator unit and heat rejection equipment.

___ 3. Power line circuit breakers or fuses have proper ratings for equipment installed.

___ 4. Control wiring connections completed between indoor evaporator and heat rejection equipment.

___ 5. All internal and external high- and low-voltage wiring connections are tight.

___ 6. Confirm that unit is properly grounded to an earth ground.

___ 7. Control transformer setting matches incoming power.

___ 8. Electrical service conforms to national and local codes.

___ 9. Check blowers and compressors for proper rotation.

___ 10. Check for loose electrical connections on steam generating humidifier. Confirm that electrode plugs are pressed firmly onto the electrode pins.

8.3 Piping

___ 1. Piping completed to refrigerant or coolant loop (if required).

___ 2. Piping has been leak-checked, evacuated and charged (if required).

___ 3. Additional oil has been added for system charges over 40 pounds (18.1kg) per circuit (see **6.2.2 - Scroll and Digital Scroll—Additional Oil Requirements**.

___ 4. Piping is properly sized, sloped and trapped as shown in the piping schematics.

___ 5. Check piping inside and outside of equipment for proper support and adequate spacing to prevent rub-through.

___ 6. Ensure TXV equalizer lines and sensing bulb lines have sufficient clearance and do not rub against other refrigerant lines.

___ 7. Ensure that factory clamps have been reinstalled.

___ 8. Drain line connected and pitched per local code.

___ 9. Water supply line connected to humidifier.

___ 10. Water/coolant fluid supply and condensate/humidifier drain line piping has no leaks or visible damage.

8.4 Other

___ 1. Ducting complete (if required), maintain access to filters.

___ 2. Filters installed.

___ 3. Check fasteners that secure compressors, reheats, humidifier and motors—some may have become loose during shipment.

___ 4. Verify water detection is properly installed around all units (recommended).

___ 5. Control panel DIP switches are set based on user requirements.

___ 6. Blower system rotates freely.

___ 7. Remove rubber band from float in optional infrared humidifier.

___ 8. Seal openings around piping and electrical connections.

___ 9. Installation materials and tools have been removed from equipment (literature, shipping materials, construction materials, tools, etc.).

___ 10. Locate blank startup sheet, ready for completion by installer or startup technician.

9.0 INITIAL STARTUP CHECKS AND COMMISSIONING PROCEDURE FOR WARRANTY INSPECTION

WARNING

Arc flash and electric shock hazard. Open all local and remote electric power disconnect switches, verify with a voltmeter that power is Off and wear personal protective equipment per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death.

Before proceeding with installation, read all included installation, operating and safety instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

Follow all local codes.

WARNING

Risk of improper wiring, piping, moving, lifting and/or handling. Can cause equipment damage, injury or death.

Only qualified service personnel should move, install or service this equipment.

Read all installation, operating and safety instructions before proceeding.

Read and follow all warnings in this manual.

CAUTION

Risk of smoke generation. Can cause fire suppression and alarm system activation, resulting in injury during building evacuation and mobilization of emergency fire and rescue services.

Startup operation of optional electric reheat elements can create smoke or fumes that can activate the facility alarm and fire suppression system. Prepare and take appropriate steps to manage this possibility. Activating reheat during initial startup may burn off particulates from electric reheat elements.

Check the steam generating humidifier electrode plugs to ensure that they are pressed firmly onto the pins. Loose connections will cause the cylinder and plugs to overheat.

Before beginning initial startup checks, make certain that unit was installed according to the instructions in this manual. All exterior panels must be in place.

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward compressor operation and unit damage.

Service technicians should use a gauge set on the Liebert PDX and Liebert PCW system during the initial startup to verify that the three-phase power is connected properly. The EC fans are not a reliable indicator of proper connection. The blowers will rotate the same direction, regardless of the three-phase power input.

- Confirm that all items on **8.0 - Checklist for Completed Installation** have been done.
- Locate "Liebert PDX and Liebert PCW Warranty Inspection Check Sheet" in the unit's electric panel. (PSWI-8542-425-CO).
- Complete "Liebert PDX and Liebert PCW Warranty Inspection Check Sheet" during startup. (PSWI-8542-425-CO).
- Forward the completed "Liebert PDX and Liebert PCW Warranty Inspection Check Sheet" to your local Emerson sales office. **This information must be completed and forwarded to Emerson to validate warranty.**
- Contact your local Emerson sales representative or Liebert Air Product Support if you have any questions or problems during unit startup and commissioning.
- Local Emerson Sales offices and Liebert Air Product Support contacts can be found at **www.liebert.com** or by calling 1-800-LIEBERT.

Liebert PDX and Liebert PCW warranty startup procedures includes the following steps. These steps must be completed to validate warranty.

9.1 Information for Warranty Inspection—Remove Power From Unit Disconnect

Complete the following items on the warranty inspection form:

- Installer name and address
- Owner name and address
- Site contact name and phone number
- Installation date
- Indoor unit model number and serial number
- Outdoor unit (condenser or drycooler) model number and serial number
- Condition of unit when received
- Is there a freight damage claim in process? If so, have all relevant parties been notified?
- Have manuals been kept with unit?
- Is the Liebert Precision Cooling unit connected to site monitoring or switchover controls?
- Provide model and serial of connected controls for switchover controls.

9.2 Startup Checks With Panels Removed and Main Disconnect Off

___ 1. Check all internal piping clamps and tighten or secure if needed.

___ 2. Check field piping for proper support and proper connection.

___ 3. Check unit electrical connections, including and Mate N' Loc connections to the control boards, and tighten or secure if needed.

___ 4. Remove all debris, tools and documents from unit area.

9.2.1 Inspect and Record

Voltage: _____

EC Plug Fan: Assemblies Tight and Secured

Filter Size: _____

Quantity: _____

Piping Size (Air Cooled Only)

Discharge: _____
Liquid: _____
___ Piping trapped according to installation manual (air cooled)

Total Equivalent Length for Discharge and Liquid Piping: _____

Compressor Model #: _____

Compressor Serial #: _____

9.3 Startup

1. Turn On the Main Disconnect.
2. Check voltage at disconnect and record.
   L1-L2 _____ L2-L3 _____ L1-L3 _____
3. Check control voltage transformers for proper output. Secondary voltage(s) should not exceed 27VAC under load. Change tap if necessary.
   T1 _____ Volts.
4. Check the compressor for proper rotation. Change wiring at input source to unit if necessary.
   Service technicians should use a gauge set on the Liebert PDX/Liebert PCW system during the initial startup to verify that the three-phase power is connected properly. The rotation direction of EC blowers is not a reliable indicator of proper connection. The blowers will rotate the same direction, regardless of the three-phase power input.
5. Check main fan amps and record.
   L1 _____ L2 _____ L3 _____ Fuse _____

6. Increase temperature setpoint to energize reheats. Check and record amperage.
   #1 _____ #2 _____ #3 _____ Fuse _____
7. Increase humidity setpoint to energize humidifier. Check and record amperage
   L1-L2 _____ L2-L3 _____ L1-L3 _____
8. **Infrared**: Check water level and adjust high limit float for proper operation.
9. If condensate pump has been supplied, check for proper operation.
10. **Chilled water and Econ-O-Coil (GLYCOOL) only**:
    a. Decrease temperature setpoint to energize valve motor. Check for full valve travel in cooling mode.
    b. Adjust controls out of cooling mode. Check for valve closure.
11. Decrease humidity setpoint to call for dehumidification. Check for valve travel in dehumidification mode.
12. Decrease temperature setpoint to energize compressor(s). Check and record compressor amps.
    L1 _____ L2 _____ L3 _____ Fuse _____
13. Check compressor operating pressure and record. (Check digital compressors fully loaded position.)
    Suction pressure _____
    Discharge pressure _____
14. Sight glass clear? _____
15. Sight glass dry? _____
16. Check superheat; values should be approximately 10°-25°F (-12 to -3.8°C).
    Circuit _____
17. Check low pressure settings.
    Low pressure cutout _____
    Low pressure cut in _____
    Winter control system (air-cooled only)
    Liebert Lee-Temp liquid level correct _____
    Record voltage to heater pads _____Volts
18. If the head pressures recorded above equal 105°F (40°C) condensing temperature, no adjustment of the glycol/water regulating valves is required If the system has balancing valves in it, these valves also should be adjusted. After the condensing temperature has been set up properly, the system should be allowed to run for 10 to 15 minutes to obtain stable conditions.
    Entering condenser water/glycol temperature _____
    Leaving condenser water/glycol temperature _____

9.4 Commissioning Procedure With Panels On

1. Disconnect all power to the environmental control unit and check.
2. Remove all line voltage fuses except the main fan fuses and the control voltage fuses in the electric panel. (Use Liebert iCOM® to activate loads.)
3. Turn On power to the unit and check line voltage on main unit disconnect switch. Line voltage must be within 10% of nameplate voltage.
4. Turn On the main unit disconnect switch and check secondary voltage at transformer T1. Voltage at T1 must be 24VAC ±2.5VAC (check at TB1-1 and TB1-5). T1 voltage must not exceed 28VAC. Change primary tap if necessary.
5. Push the On button. Blower will start and the On lamp will light.
6. Check fan rotation if not correct make necessary changes to the line side of the unit disconnect with power Off. **(The unit is phased at the factory.)**
7. Unit will operate at the factory-set configuration for all component operations. The operator may set the values for temperature and humidity setpoints, the proportional band and the deadband. The user menu may be used to set alarms and other control functions. Refer to the Liebert iCOM user manual, SL-18835, for large or small display operation and settings.

NOTICE

Risk of improper Liebert iCOM operation. Can cause damage to equipment.

Do not change Advanced Menu parameter settings in the Liebert iCOM without first getting permission from Emerson Network Power® Liebert Services.

Lowering this parameter to less than 100% will cause the coil to freeze on DX units, will overheat the reheat components on any unit and cause condensation problems on any unit equipped with a humidifier.

8. Turn Off the unit with the On/Off button.
9. Remove power from main unit disconnect and main breaker and check with a meter.
10. Replace all fuses removed in **Step 2**.
11. Restore power to the unit.
12. Turn On the main unit disconnect switch.
13. Press the On button.
14. Check and record the current draw on all line voltage components and match with serial tag.

NOTE

*Electric Reheat. See **Caution on page 59**. Activate for a minimum of five (5) minutes.*

15. Check for unusual noises and vibration. Note observations on the warranty inspection form's comments section.
16. Check all refrigerant and water lines for leaks. Note observations on warranty inspection form.
17. Record all of the following on the warranty inspection form:
    - All component voltages and current draws
    - All air / water temperatures indoor and outdoor
    - All refrigerant and water / glycol pressures,
    - All levels of refrigerant and oil in sight glasses
    - Record refrigerant pressure switch settings and operating pressures
    - Record superheat and subcooling.

NOTE

Unit superheat should be in the range of 10 to 20°F (-12 to -6°C).

18. Test all control sequences and functions of your unit for proper operation. Use Liebert iCOM user manual as a guide to system control operations.
19. Complete the warranty inspection form with sign-off data.

Return Completed Startup Form to Your Local Emerson Sales Office

Local Emerson sales offices and air product support contacts can be found on the Liebert Web site: **www.liebert.com** or call 1-800-LIEBERT for Thermal Management product support.

10.0 MAINTENANCE

For assistance, contact Emerson Network Power® Liebert Services at 1-800-LIEBERT.

WARNING

Arc flash and electric shock hazard. Open all local and remote electric power disconnect switches, verify with a voltmeter that power is Off and wear personal protective equipment per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death.

Before proceeding with installation, read all included installation, operating and safety instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

Follow all local codes.

WARNING

Risk of electric shock. Can cause injury or death.

Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before working within the various component electric connection enclosures.

WARNING

Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, injury or death.

Only qualified service personnel should work on this equipment.

Read all installation, operating and safety instructions before proceeding.

Read and follow all warnings in this manual

NOTICE

Risk of improper Liebert iCOM® operation. Can cause damage to equipment.

Do not change Advanced Menu parameter settings in the Liebert iCOM without first getting permission from Emerson Network Power Liebert Service.

Lowering this parameter to less than 100% will cause the coil to freeze on DX units, will overheat the reheat components on any unit and cause condensation problems on any unit equipped with a humidifier.

The Liebert PDX and Liebert PCW are single components in the facility heat removal system. The system includes air distribution (raised floors, duct systems), outdoor heat rejection (condensers, pumps, drycoolers, cooling towers, piping, heat rejection fluid, ambient temperature, etc.) and indoor cooling and humidity loads (equipment load, location, outside air infiltration). Proper application and maintenance of the entire system is critical to the life and reliability of the Liebert PDX and Liebert PCW.

- Good maintenance practices are essential to minimizing operation costs and maximizing product life.
- Read and follow monthly and semi-annual maintenance schedules included in this manual. These MINIMUM maintenance intervals may need to be more frequent based on site-specific conditions.
- See the Liebert iCOM® user manual, SL-18835, for instructions on how to utilize the unit controller to predict some service maintenance intervals.
- Emerson recommends the use of trained and authorized service personnel, extended service contracts and factory-specified replacement parts. Contact your local Emerson representative.

10.1 Filters

NOTICE

Risk of improper filter installation. Can cause filter collapse and airflow reduction.

Pleat direction is non-standard. Use only short-pleat filters. Long-pleat filters are subject to collapse at high airflows.

To maximize the performance and reliability of Liebert PDX and Liebert PCW equipment, use only Liebert filters. Contact your local Emerson representative to order replacement filters.

Table 16 Filters, number and size

	017, 018, 023, 029
Downflow Models	
Quantity	1
Nominal Size, inches	29.5 x 28.5 x 2
Upflow Models	
Quantity	1
Nominal Size, inches	34 x 28 x 2

Disposable Type - Nominal sizes and number required, Standard MERV 8 or Optional MERV 11

10.1.1 Filter Replacement Procedure—Downflow Units

1. Disconnect power from the Liebert PDX/Liebert PCW.
2. Using a stepladder, remove filters from the top of the unit.
3. Replace with new filter—install the filter in the proper direction of the airflow.
4. Test the operation of the filter clog switch.
   The unit panels must be in place and closed to find this point.
5. Start the blower and turn the switch counterclockwise until the alarm is energized.
6. Turn the adjusting knob one turn clockwise or to the desired filter change point.

10.1.2 Filter Replacement Procedure—Upflow Units

1. Disconnect power from the Liebert PDX/Liebert PCW.
2. Open the front access panel and remove the filter.
3. Replace with new filter—install the filters in the proper direction of the airflow.
4. Test the operation of the filter clog switch.
   The unit panels must be in place and closed to find this point.
5. Start the blower and turn the switch counterclockwise until the alarm is energized.
6. Turn the adjusting knob one turn clockwise or to the desired filter change point.

10.2 Blower Drive System—EC Fans

10.2.1 Fan Impellers and Bearings

Fan impellers should be periodically inspected and any debris removed. Check to ensure that the impellers can rotate freely and that the fan guards are still properly mounted for sufficient protection against accidentally contacting the impeller. Bearings used on the units are maintenance-free. Consult the factory for more information.

10.2.2 Protective Features

Monitoring functions protect the motor against overtemperature of electronics, overtemperature of motor and incorrect rotor position detection. With any of these failures, an alarm will display through the Liebert iCOM® and the motor stops electronically. There is no automatic restart. The power must be switched off for a minimum of 20 seconds once the motor is at a standstill.

The motor also provides locked rotor protection, undervoltage/phase failure detection and motor current limitation. These conditions will display an alarm through the Liebert iCOM.

WARNING

Risk of electric shock. Can cause serious injury or death.

Open all local and remote electric power disconnect switches and verify with a voltmeter that power is Off before working within the EC fan electric connection.

The motor connection enclosure may contain a stored electrical charge after power is disconnected. Wait 10 minutes before opening the fan motor electrical connection enclosure and working within.

CAUTION

Risk of contact with extremely hot surfaces. Can cause injury.

The electronics housing can get hot and can cause severe burns.

Wear thermally insulated gloves and use proper skin protection when touching the electronics housing or allow time for the housing to cool before replacing parts.

CAUTION

Risk of improper moving, lifting and handling. Can cause equipment damage or injury.

Only properly trained and qualified personnel should work on this equipment. The fan module weighs approximately 100 lb. (45.4kg). Use OSHA-recommended lifting techniques and take precautions to avoid back injury and dropping during removal.

NOTICE

Risk of improper installation. Can cause equipment damage.

Only a properly trained and qualified technician should install or open this motor.

Use 60/75°C Class 1 copper wire only.

10.3 Removing EC Fans—Downflow Models

Liebert PDX and Liebert PCW downflow models are equipped with EC fans. The modules are removable for easier maintenance and replacement.

WARNING

Arc flash and electric shock hazard. Can cause injury and death.

Open all local and remote electric power supplies, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure.

Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before working within the EC fan electric connection enclosure.

Before proceeding with EC fan removal and/or replacement, read all instructions, verify that all the parts are included and check the EC fan nameplate to be sure the voltage matches the unit nameplate electrical rating.

The Liebert iCOM® microprocessor does not isolate power from the unit, even in the Unit Off mode.

This kit should be installed only by properly trained and qualified personnel.

WARNING

Risk of contact with high speed rotating blower wheel fan blades. Can cause injury or death.

Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and verify that the blower wheel has stopped rotating before working within the unit.

WARNING

Risk of very heavy fan module dropping downward suddenly. Can cause injury or death.

Only properly trained and qualified personnel should work on this equipment.

The fan module weighs approximately 100 lb. (45.4kg).

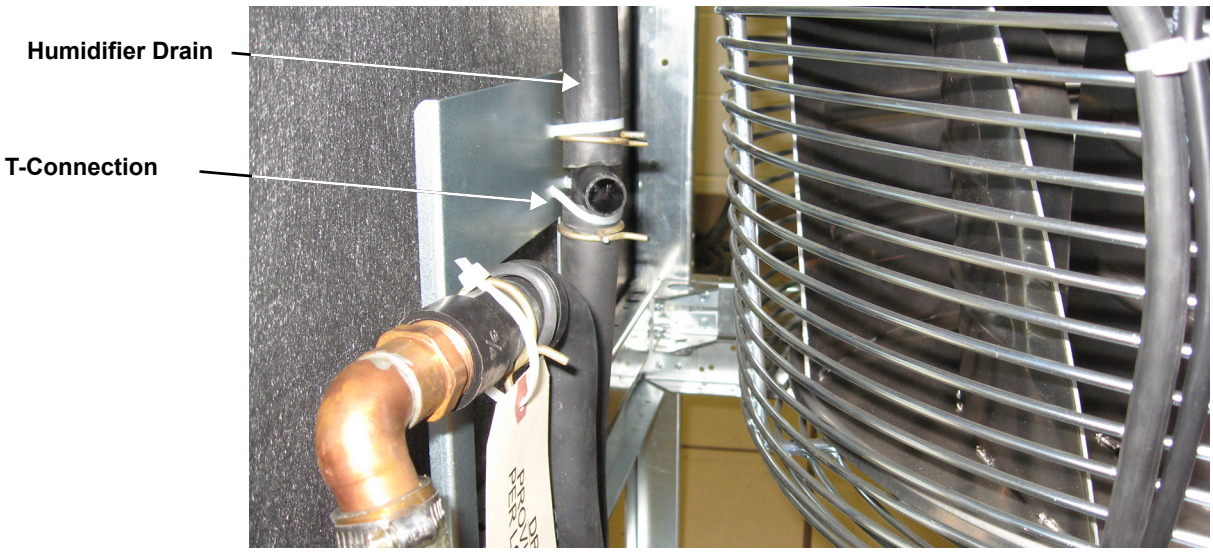
CAUTION

Risk of contact with hot surfaces. Can cause burn injury.

The EC fans and electronics housing are extremely hot during operation. Allow sufficient time for them to cool before handling. Use extreme caution and wear OSHA-approved safety glasses and thermally insulated gloves and arm protection when replacing or performing maintenance on the EC fans.

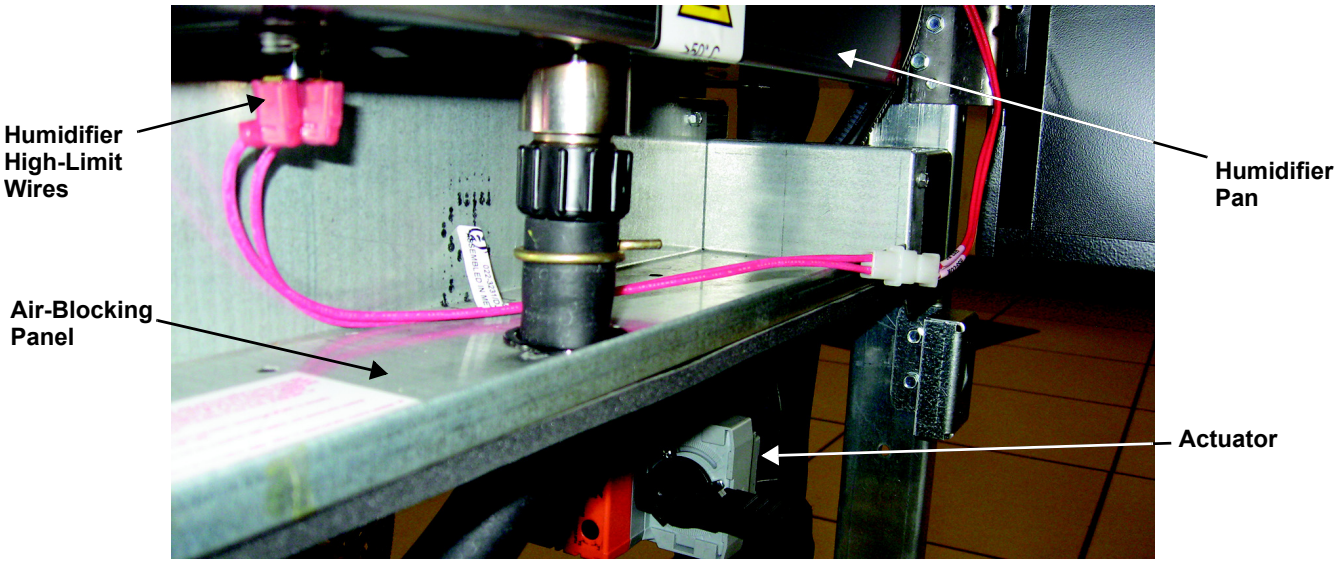
1. Turn off the Liebert PDX/PCW with the I/O button on the Liebert iCOM.
2. Allow the unit shut down. Once shutdown is complete, turn the disconnect switch to the Off position.
3. Open the front of the unit.
4. Remove the humidifier drain line by removing it from the T-connection on the left side of the unit and disconnecting it from the humidifier pan. Then pull it up through the humidifier air-blocking panel it passes through. See **Figure 36**.

Figure 35 Remove the humidifier drain line



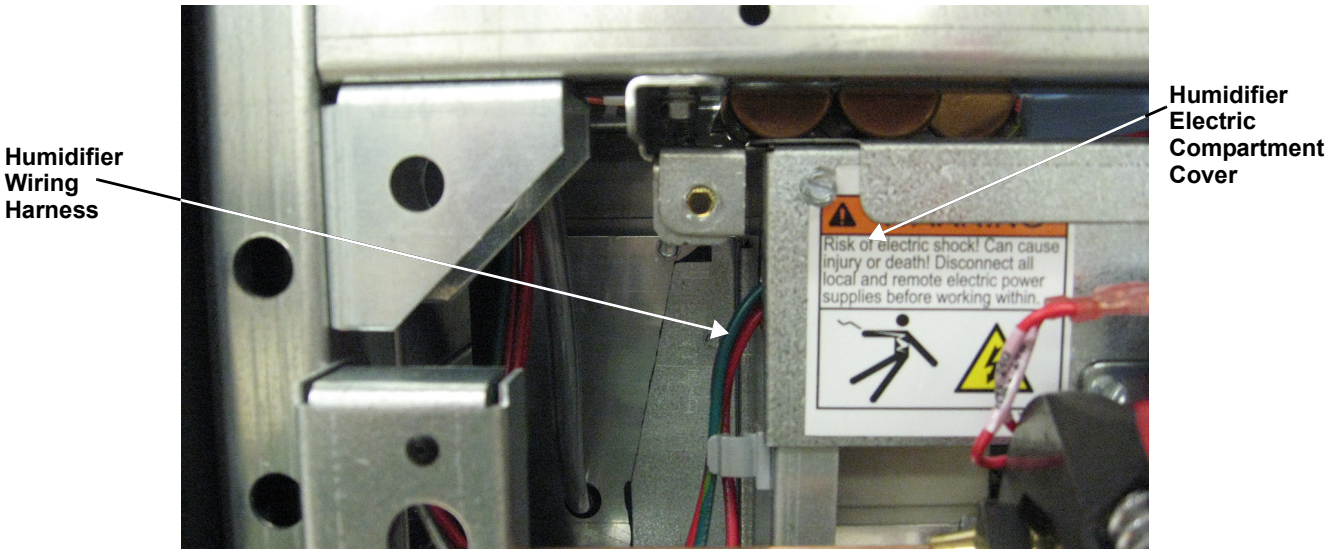
5. Remove the humidifier high-limit wires connected to the humidifier high-limit located on the bottom of the humidifier pan. See **Figure 36**.

Figure 36 Remove humidifier high-limit wires



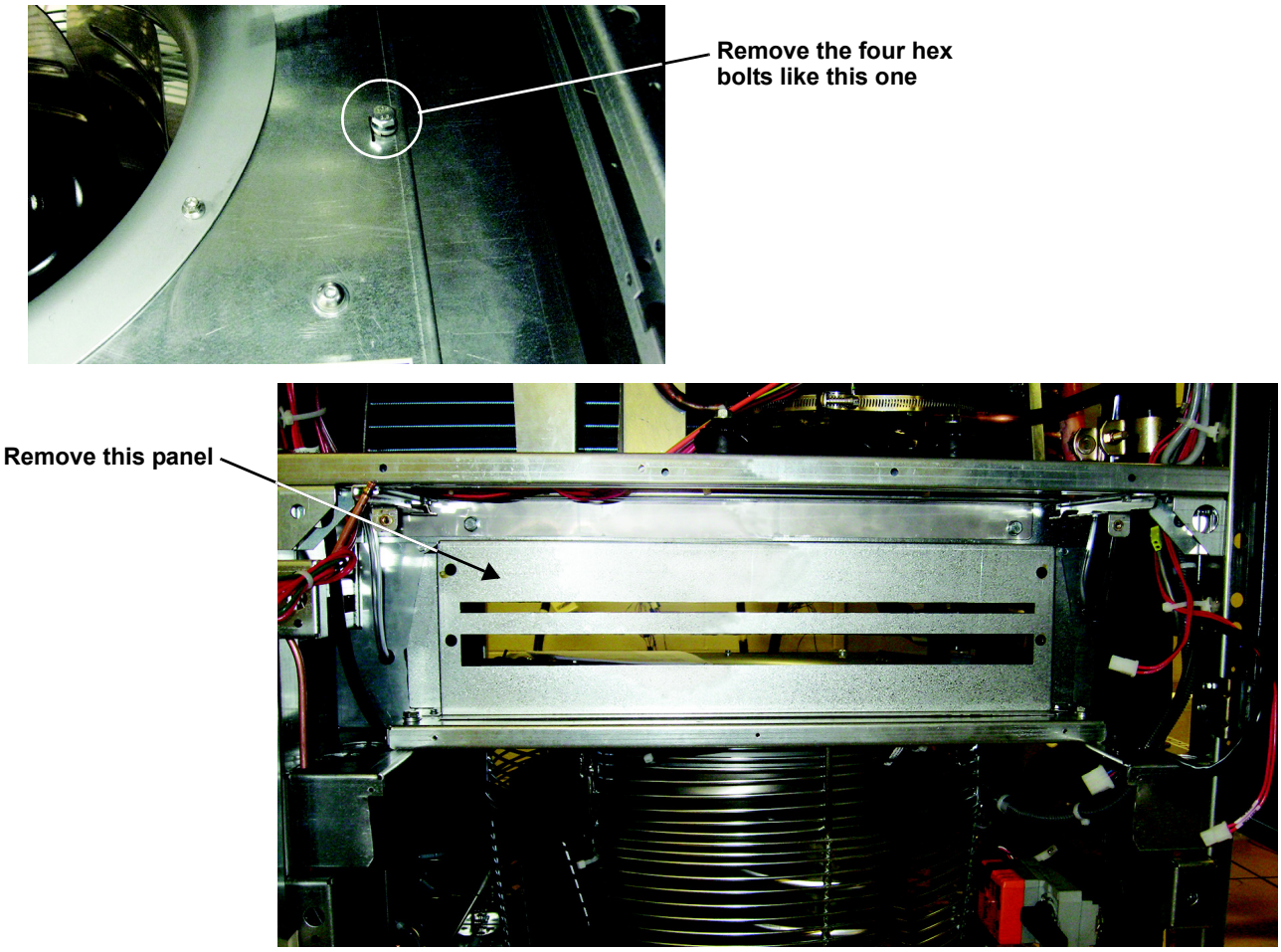
6. Disconnect the actuator from the pipe beneath the right side of the humidifier (if present). See **Figure 36**.
7. Remove the humidifier air block-off panel. See **Figure 36**.
8. Locate the humidifier assembly and remove the cover to the electrical compartment. Disconnect the wires entering the humidifier electric box from the left side. See **Figure 37**.

Figure 37 Humidifier electric box location



9. Remove the four bolts securing the humidifier assembly to the unit; remove the humidifier from the unit.
10. Remove the panel located behind the humidifier's previous location. This will reveal the panel and make it accessible. See **Figure 38**.

Figure 38 Bolt and panel removal



11. Remove the smoke detector tubing from the right side; remove the air sail tubing from the left side.
12. Remove the high and low voltage wiring supplying the fan.
13. Remove the four hex bolts securing the mounting panel to the unit. Remove only the bolts indicated in **Figure 38**.
14. Slide the EC fan assembly forward and out of the unit.
15. Place the new EC fan assembly in the unit on the mounting rails that supported the old assembly.
16. Connect all high-voltage and low-voltage wiring.
17. Secure the new assembly using the same hardware removed in **Step 13**.
18. Reattach smoke detector and air-sail tubing removed in **Step 11**.
19. Reinstall the panel removed in **Step 10**.
20. Reinstall the humidifier air-blocking panel removed in **Step 7**.
21. Reinstall the humidifier assembly and reconnect the wire harness removed in **Step 9**.
22. Run the drain humidifier drain that was removed in **Step 4** through the humidifier air-blocking panel. Connect to the T-connection on the left side of the unit; reconnect the humidifier's high-limit wires to the bottom of the humidifier pan that were removed in **Step 5**.
23. Reconnect the actuator (if present) that was removed in **Step 6**.
24. Replace the front panel of the unit. Turn main disconnect to On. Turn unit On at display and verify the new fan starts.

10.4 Humidifier—Infrared

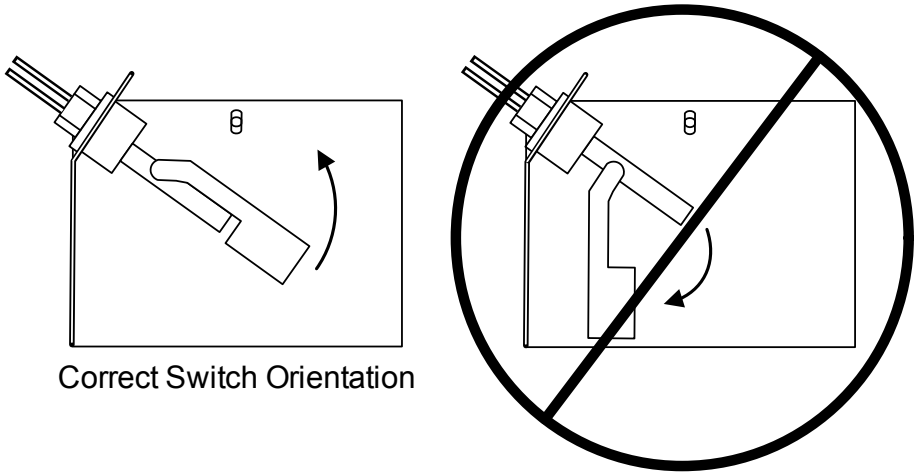
During normal humidifier operation, deposits of mineral solids will collect in humidifier pan and on the float switch. These must be cleaned periodically to ensure proper operation. Frequency of cleaning must be locally established since it is dependant on humidifier usage and local water quality. A spare pan is recommended to reduce maintenance time at unit. The Liebert autoflush system can greatly increase the time between cleanings, but does not eliminate the need for periodic checks and maintenance (see Liebert iCOM® user manual SL-18835 for autoflush setup). To help reduce excessive scaling in locations with difficult water quality, the use of Vapure™ is recommended (contact your local Emerson representative).

10.4.1 Cleaning Humidifier Pan and Float Switch

Before turning the unit Off:

1. With unit operating, remove call for humidification at the Liebert iCOM control.
2. Let the blower operate 5 minutes to allow the humidifier and water to cool.
3. If unit has a condensate pump, turn unit OFF at Liebert iCOM control.
4. Pull out the humidifier standpipe in pan.
5. Inspect the O-ring (replace if necessary).
6. Let the pan drain and condensate pump operate (if applicable).
7. Disconnect power from the unit.
8. Disconnect the drain coupling from the bottom of the pan.
9. Remove the thermostat from the bottom of the pan and the retaining screws from the sides of the pan.
10. Slide the pan out.
11. Loosen scale on side and bottom of pan with a stiff nylon brush or plastic scraper.
12. Flush with water.
13. Carefully clean scale off float switch (make sure to reinstall correctly (see **Figure 39**).
14. Reinstall the pan, thermostat, standpipe, drain coupling and screws into the humidifier.
15. Operate the humidifier and check for leaks.

Figure 39 Correct float switch orientation



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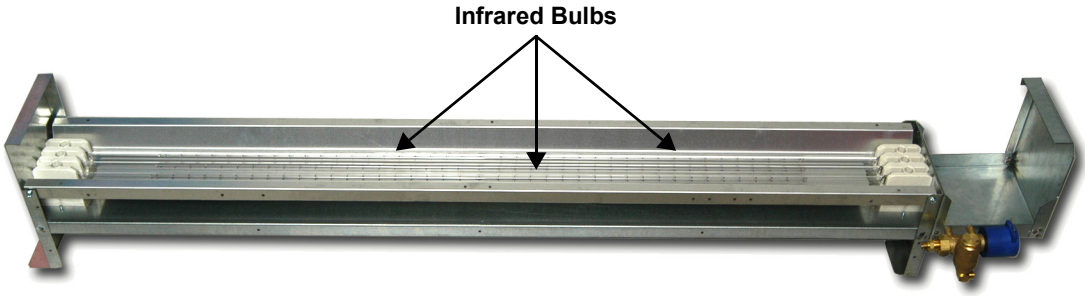
10.4.2 Changing Humidifier Lamps

NOTE
Touching quartz lamps with bare hands will severely shorten bulb life. Skin oils create hot spots on lamp surface. Wear clean cotton gloves when handling lamps.

1. Remove humidifier pan (see **10.4.1 - Cleaning Humidifier Pan and Float Switch**, **Steps 1** through **10**).
2. Disconnect power from unit.
3. At humidifier, remove screws and cover from high-voltage compartment.
4. Disconnect one end of purple jumper wires.
5. Using a continuity meter, locate burned out lamp.
6. Remove lamp brackets under lamps.
7. Loosen two screws securing lamp lead wires to junction block.
8. Pull bulb straight down and discard.
9. Wrap lead wires once around new lamp's metal ends. This will support lamp and allow for thermal expansion. Insert lead wires into junction block and torque screws to 30 in-lb.
10. Reassemble by reversing **Steps 1** through **9**.

Figure 40 Infrared humidifier lamps



10.5 Humidifier—Steam Generating

The humidifier drains and refills to maintain a current setpoint and alert the operator when the humidifier canister needs to be replaced.

Figure 41 Steam generating humidifier canister

10.5.1 Replacing the Steam Generating Humidifier Canister

WARNING

Arc flash and electric shock hazard. Can cause injury and death.

Open all local and remote electric power supplies, verify with a voltmeter that power is Off and wear appropriate personal protective equipment per NFPA 70E before working within the electric control enclosure.

Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is Off before working within the humidifier enclosure or disconnecting the canister power wires.

Before proceeding with canister replacement:

- Read all installation, operating and safety instructions
- Verify that all the parts are included and
- Verify that the new caniste's voltage matches the voltage of the canister that was removed.

The Liebert iCOM® does not isolate power from the humidifier, even in the Unit Off mode.

This kit should be installed only by properly trained and qualified personnel.

WARNING

Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, injury or death.

Only properly trained and qualified service personnel should work on this equipment.

Read all installation, operating and safety instructions before proceeding.

Read and follow all warnings in this manual.

WARNING

Risk of smoke and fire. Can cause activation of fire suppression systems, building evacuation, dispatching of fire/rescue equipment and personnel and catastrophic canister failure resulting in water leaks, equipment damage, injury or death.

Using a humidifier canister that has reached the end of it's service life can be extremely hazardous. If the canister cannot be replaced immediately at the end of life condition, turn Off the power and water supply to the humidifier and remove the canister until a replacement canister can be installed.

Do not ignore humidifier problem alarms. Resetting humidifier without addressing cause may result in fire or damage due to leaking water. See **Table 18**, for alarm corrective actions.

CAUTION

Risk of contact with hot surfaces. Can cause burn injury.

The humidifier canister and steam discharge lines are extremely hot during operation. Allow sufficient time for them to cool before handling. Use extreme caution and wear OSHA-approved safety glasses and thermally insulated gloves and arm protection when performing maintenance on the humidifier.

After an extended period of operation, in accordance with life expectancy information, the cylinder is completely used as indicated by the amber high water sensor light illuminated on the cabinet. When this condition is reached, a new replacement cylinder is to be installed.

NOTE

The amber high water sensor light may come on during initial startup but this instance does not indicate that the cylinder should be replaced.

The steam cylinder is disposable and must be replaced at the end of the cylinder's life. Cylinder life will vary according to water supply conditions and humidifier usage.

Table 17 Humidifier canister part numbers

Unit Model	200V, 208V, 230V	380/415V, 460V	Humidifier Model
PX018, 023, 029	317911p1	317911p2	MES 2
PW017, 029			MES 2

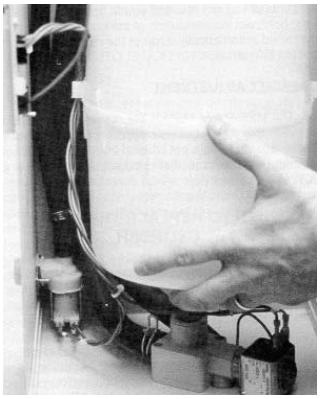
Removing the Old Canister

To replace a used-up humidifier cylinder, refer to **Figure 42** and perform these steps:

1. Turn Off the water supply to unit.
2. The old cylinder must be drained completely before removing. This is done by pushing the auto On/Off/drain switch to the Drain position.
3. When completely drained, push the auto On/Off/Drain switch to the Off position.
4. Open the main electrical disconnect during the entire cylinder change operation.
5. The power wires to the cylinder are attached by cylinder plugs to the electrode pins on top of the cylinder. Pull up to remove the plugs from the pins.
6. Use slotted screwdriver to loosen the steam hose clamp(s)
7. Disconnect the steam hose by pulling it straight up.
8. Loosen the reversible cylinder zip tie.

The cylinder is now ready to be lifted out of the unit.

Figure 42 Removing the old canister



Mandatory Cleaning of the Drain Valve

Always clean the drain valve before installing a new cylinder. **Figure 43** shows an exploded view of the drain valve for reference to clean it.

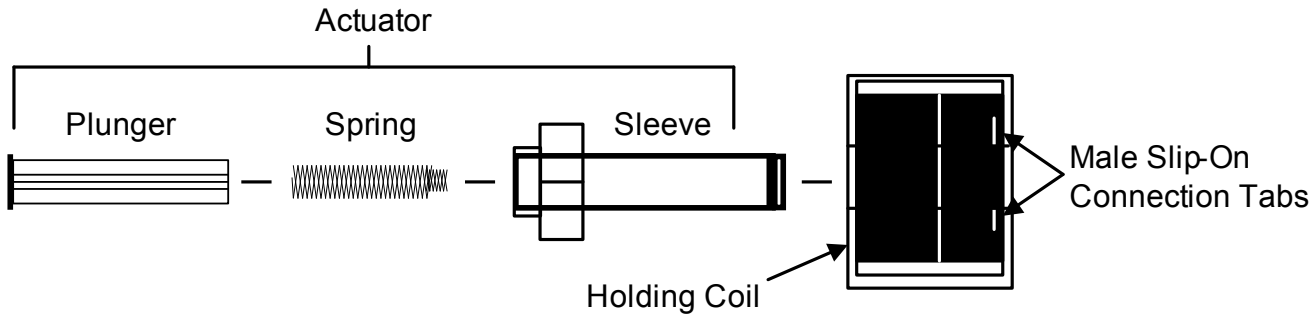
1. Remove old cylinder as previously described.
2. Note that the ring terminal for the drain valve green ground wire is sandwiched between the drain valve and the drain pan.
3. Remove the two screws securing the drain valve body to the drain pan.
4. Remove the hose clip and hose connection from the drain valve body.
5. Drain valve assembly is now free to be taken to a sink for disassembly and cleaning.
6. Remove the snap fit red cap from the coil assembly and slide the coil off the actuator.
7. Loosen actuator using a wrench and unscrew from the plastic body.
8. Clean the exposed core, spring and plastic drain valve pot
9. Reinstall in the reverse order.

NOTE

Be cautious when putting the spring back into the plunger, the taper end of the spring must be installed toward the solenoid.

10. Hand tighten the actuator back into place, then secure it by using a wrench to turn it a quarter of a turn.
11. Clean out the end of the hose, then reconnect it to the drain valve body with the clamp.
12. Fit mounting screws back through the drain valve body, one through ring terminal on the green wire.

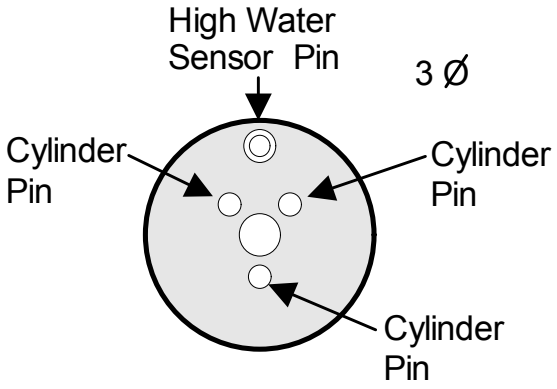
Figure 43 Drain valve assembly



Installing the New Canister

1. The reverse procedure should be followed to install a new cylinder. The main electrical disconnect is to be left open until the cylinder is completely installed and reconnected.
2. The blue sensor plug on all units is for the high water sensor pin, which always goes on the single pin with collar offset from the others. See **Figure 44**.
3. Ensure that cylinder plugs are snug on the pins. Replace any loose fitting plugs as these may result in hazardous operation.

Figure 44 Canister plugs



WARNING

Risk of humidifier canister meltdown, smoke and fire. Can cause fire suppression system activation, fire and smoke alarm activation, building evacuation, dispatching of fire and rescue equipment and personnel and water leaks resulting in expensive equipment or building damage, injury or death.

Check steam generating humidifier electrode plugs to ensure that they are pressed firmly onto pins. Loose connections will cause overheating of cylinder and plugs.

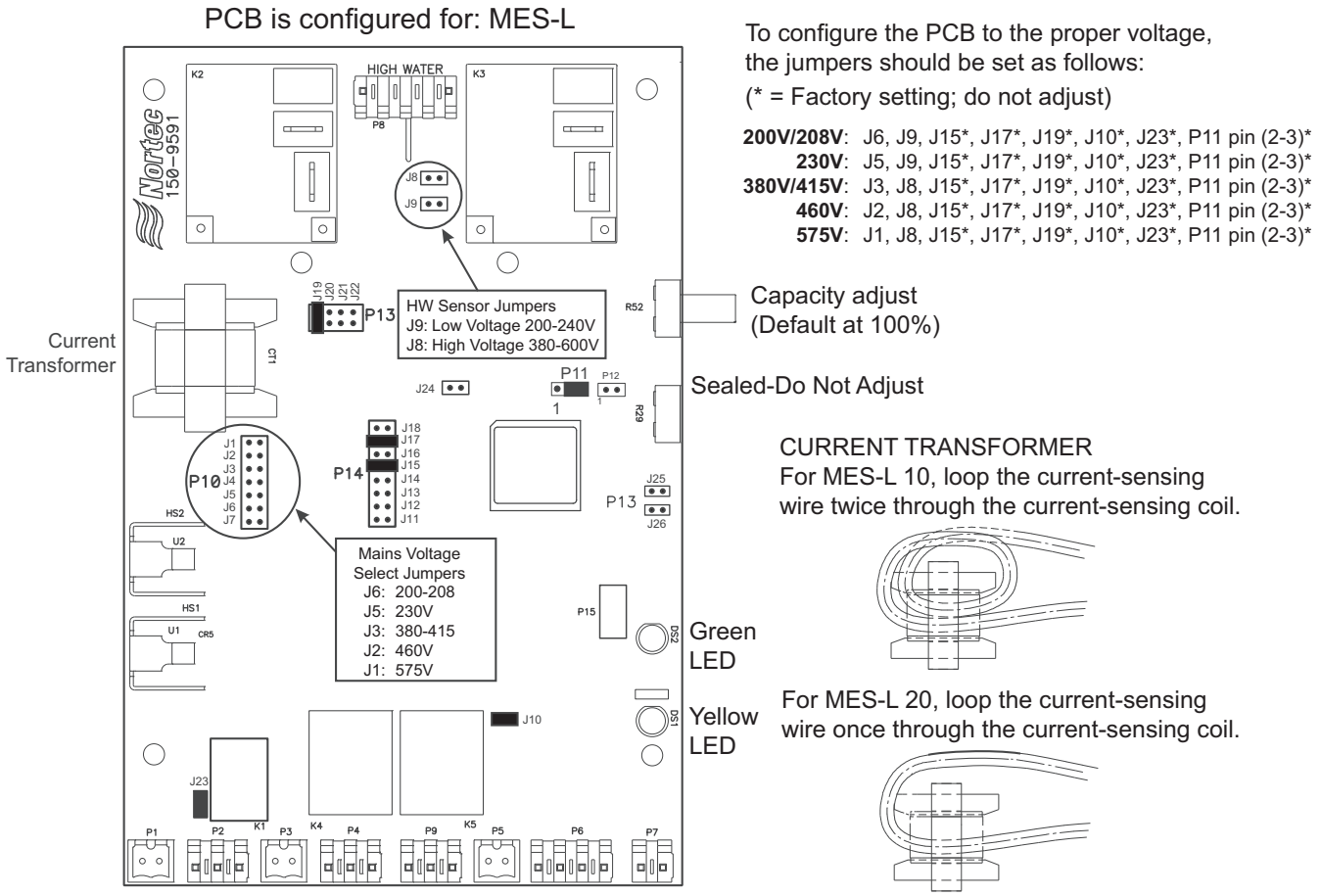
Table 18 Steam generating humidifier status lamps: causes, corrective action

Unit Status Lamp			
Yellow	**Green**	**Symptom**	**Corrective Actions**
On	On	Maximum water level inside cylinder.	This usually happens on initial startup after replacing the cylinder (normal). Water is concentrated with minerals inside the cylinder. Let unit run, yellow light will disappear when the unit is at full output. This may take a day or two.
Off	Off	No power to the board.	Check for main power supply fault. Turn power switch to DRAIN position. If drain valve is activated (sound of solenoid), check connection to the board or board itself. When no sound present, check fuse (replace with 3A, if needed), transformer (voltage should be present between fuse holder and ground screw).
One flash sequence	Off	Excess current. Operating amperage exceeded 130% of rated amps. Water is drained from the cylinder (drain valve on for 10 min.).	Check drain valve operation, drain time, possible drain restrictions. Check if fill valve leaks (not holding supply water). Back-pressure may also cause very conductive water conditions. Check for short cycling. Water conductivity too high.
Two flashes in sequence	Off	No current detection for 30 minutes with continuous call for humidity.	Check water level in the cylinder - should be more than one-quarter full. If it is not, check the fill rate, 24VAC voltage on fill valve terminals (unit must be on with call for humidity - green light steady on). Verify fresh water supply to the humidifier. Leaking drain valve can be at fault (minerals blocking the plunger). If cylinder is more than ¼ full, check primary power, connections to the cylinder, continuity of wires to cylinder. Are power wires connected to proper terminals on the cylinder? (Color coding) Low water conductivity.
Three flashes in sequence	Off	No current detected with high water sensor activated.	Check L1 to ensure that power is properly connected. Check that L1 wire runs through CT of main PCB. Cylinder may be defective, check for conductivity between powered pins and H.W.S. (should be an opened circuit). Ensure all legs are drawing similar current. Low water conductivity. Are power wires connected to proper terminals on the cylinder? (Color coding). Foaming.
Four flashes in sequence	Off	End of cylinder life; change cylinder.	Check water level in the cylinder; it should be about three-fourths full. Check for foaming if water level lower or cylinder life shorter than expected. Change cylinder, clean drain valve.

Table 19 Steam generating humidifier troubleshooting guide

Symptom	Possible Cause	Check or Remedy
Unit in call for humidification, humidifier will not operate	Humidifier not receiving power	Verify ON/OFF/DRAIN switch is in ON position.
		Check fuses or CB's and replace or reset if necessary.
Humidifier Contactor pulled in, but no water enters canister	No water available to unit	Check external water shut-off valves.
	Clogged fill line strainer	Clean or replaced fill line strainer
Excessive arcing in canister	Drain valve clogged or defective	Verify that drain valve operates freely when activated. Clean valve and replace if defective. Flush canister several times and replace if arcing persists.
	Improper water supply	If water is commercially softened, reconnect humidifier to raw water supply, drain canister and restart. If connected to hot water supply, reconnect to cold water.
	Insufficient drain rate	Verify that drain valve operates freely when activated. Clean valve and replace if defective. Flush canister several times and replace if arcing persists.
	Excessive mineral content in water	Analyze mineral content of water. If mineral content is excessive contact Liebert Services.

Figure 45 Circuit board diagram



10.6 Condensate Drain and Condensate Pump Systems

10.6.1 Condensate Drain

Check and clear obstructions in tubing during routine maintenance.

10.6.2 Condensate Pump

- Disconnect power to unit using disconnect switch.

WARNING

Risk of electric shock. Can cause injury or death.

Open all local and remote electric power disconnect switches and verify that power is Off with a voltmeter before working within the condensate pump electrical connection enclosure.

The Liebert iCOM® does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "Unit Off" mode of the Liebert iCOM.

- Check and clear obstructions in gravity lines leading to condensate pump.
- Remove sump and clean with a stiff nylon brush and flush with water.
- Inspect and clear clogs in discharge check valve and float mechanism.
- Reassemble and check for leaks.

10.7 Air-Cooled Condenser and Drycoolers

- Clear coil surface of all debris that will inhibit airflow.
- Check for bent or damaged coil fins and correct.
- Do not permit snow to accumulate around or under outdoor unit.
- Periodically consider commercial cleaning of coil surface
- Inspect fans, motors and controls for proper operation.
- Check all piping and capillaries for proper support.
- Inspect for leaks.

10.8 Reheat—Electric Reheat

- Inspect and clean reheat elements.
- Inspect and tighten support hardware.

10.9 Thermostatic Expansion Valve

The Thermostatic Expansion Valve (TEV) performs one function: It keeps the evaporator supplied with enough refrigerant to satisfy load conditions. It does not effect compressor operation.

Proper valve operation can be determined by measuring superheat. The correct superheat setting is between 10 and 20°F (-12 and -6°C). If too little refrigerant is being fed to the evaporator, the superheat will be high; if too much refrigerant is being supplied, the superheat will be low.

10.9.1 Determine Suction Superheat

To determine superheat:

1. Measure the temperature of the suction line at the point the TEV bulb is clamped.
2. Obtain the gauge pressure at the compressor suction valve.
3. Add the estimated pressure drop between the bulb's location and the suction valve.
4. Convert the sum of the two pressures to the equivalent temperature.
5. Subtract this temperature from the actual suction line temperature. The difference is superheat.

10.9.2 Adjust Superheat Setting with the TEV

To adjust the superheat setting:

1. Remove the valve cap at the bottom of the valve.
2. Turn the adjusting stem counterclockwise to lower the superheat.
3. Turn the adjusting stem clockwise to increase the superheat.

NOTE
Make no more than one turn of the stem at a time. As long as thirty minutes may be required for the new balance to take place.

10.10 Electronic Expansion Valve

An optional Electronic Expansion Valve (EEV) is available in place of the standard thermal expansion valve (TXV). The EEV controls superheat through the Liebert iCOM® controls by actively measuring suction pressure via a transducer attached to the suction line rotalock and suction temperature via a thermistor strapped to the suction line. The EEV actively adjusts the orifice size and resulting mass flow of refrigerant to maintain the superheat setpoint (set in Liebert iCOM).

NOTE

Intermittent loss of subcooling may result in EEV/superheat instability. If superheat instability is observed, check for proper refrigerant level in receiver (see 8.2.1 - Piping Guidelines—Air-Cooled Units for the proper charge level). If proper charge is observed in receiver, and superheat remains unstable, then increase superheat setting in the Liebert iCOM to 15°F (8.49°C).

10.11 Compressor

10.11.1 Compressor Oil

NOTICE

Risk of improper compressor lubrication. Can cause compressor and refrigerant system damage.

Failure to use oil types, viscosities and quantities recommended by the compressor manufacturer may reduce compressor life and void the compressor warranty. See oil types specified in **Table 20**.

- Do NOT mix polyolester (POE) and mineral-based oils.
- Do NOT mix oils of different viscosities.

Consult Emerson or the compressor manufacturer if you have questions.

Table 20 Compressor oil types

Compressor Type	Refrigerant Type
	R-407c
Copeland Scroll and Digital Scroll	POE Oil - ISO 32 Viscosity [1]

1. Use Copeland POE Oil ULTRA 32-3MAF or other Copeland-approved oils.

10.11.2 Scroll and Digital Scroll Compressors

Hermetic scroll and digital scroll compressors do not have an oil sight glass.

NOTE

*Refer to **6.2.2 - Scroll and Digital Scroll—Additional Oil Requirements** for approved oil types and additional oil required based on the system's refrigerant charge.*

10.11.3 Compressor Replacement

Replacement compressors are available through your local Emerson office. Compressors are shipped in reusable packaging. If unit is under warranty, complete and include Liebert Service Credit Application (LSCA) with the compressor that is being returned. The original compressor should be returned in the same packaging.

10.11.4 Compressor Motor Burnout

If a burnout has occurred, a full system clean-out is required; if not, compressor and system problems will continue.

For clean-out warnings and procedures, see Copeland Application Engineering Bulletin 24-1105 "Principles of Cleaning Refrigeration Systems."

10.11.5 Digital Compressor Unloading Solenoid(s)

When replacing a digital scroll compressor, digital solenoid valve and coil must be replaced. Compressor and valve kit are shipped separately. Valve kit must be field-brazed to top of compressor in proper orientation and supported with original factory bracket.

10.11.6 Compressor Replacement Procedure

1. Disconnect power and follow all warnings at front of this manual.
2. Attach suction and discharge gauges to access fittings.
3. Front-seat service valves to isolate the compressor. Reclaim charge from compressor.
4. Remove marked pressure transducer and discharge pressure switch. Disconnect all electrical connections.
5. Detach service valves from compressor.
6. Remove failed compressor.
7. If required, follow compressor manufacturer's suggested clean-out procedures.
8. Install replacement compressor and make all connections. Replace gaskets or seals on service valves. Replace unloading solenoid.
9. Evacuate, charge and operate per **6.2.3 - Air-Cooled Condenser Without Liebert Lee-Temp™ System** or **6.2.4 - Air Cooled Liebert MC™ Condensers with Liebert Lee-Temp™ "Flooded Condenser" Head Pressure Control System**.

NOTICE

Risk of improper component reinstallation. Can cause equipment damage.

Identify and mark location of suction pressure transducer and discharge pressure switch. These devices look similar and they must be reinstalled in their original location.

10.12 Facility Fluid and Piping Maintenance

Maintaining facility water and glycol quality is required throughout the life of the coolant fluid piping system. Fluid and piping system maintenance schedules must be established and performed. A coolant fluid maintenance program must be established that will evaluate fluid chemistry and apply necessary treatment. The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program.

Perform periodic inspections of the facility and the unit coil and/or heat exchanger and coolant fluid piping system for leaks and visible damage. Refer to **6.3 - Fluid Connections for Systems Using Water/Glycol and Chilled Water**.

10.13 Glycol Solution Maintenance

It is difficult to establish a specific schedule of inhibitor maintenance since the rate of inhibitor depletion depends upon local water conditions. Analysis of water samples at time of installation and through a maintenance program should help to establish a pattern of depletion. A visual inspection of the solution and filter residue is often helpful in judging whether corrosion is occurring.

The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program. Improper use of water treatment chemicals can cause problems more serious than using none. Proper inhibitor maintenance must be performed to prevent corrosion of the glycol system. Consult glycol manufacturer for testing and maintenance of inhibitors. Do not mix products from different manufacturers.

10.14 Motorized Ball Valve

Discharge pressure is controlled by a motorized ball valve. During unloaded operation, the pressure changes during each digital cycle could result in excessive repositions with a pressure operated water regulating valve. The control algorithm for the motorized ball valve uses an intelligent sampling rate and adjustable pressure thresholds to reduce valve repositions. The valve assembly consists of the brass valve, linkage and actuator.

Control

The valve actuator operates on 24VAC power and is controlled by a 2-10VDC proportional control signal. The valve full open to full close time is 60 seconds. At 2VDC the valve is closed; at 10VDC the valve is fully open. There is a 20-second delay to position the motorized ball valve before starting the compressor.

Control Method

The control utilizes an upper and lower pressure threshold with a 35 psi (241 kPa) deadband to reduce valve movement. If the liquid pressure is between the upper and lower threshold the valve remains at the current position. If the liquid pressure exceeds the upper threshold the valve opens, and if the pressure falls below the lower threshold the valve closes. There are multiple adjustment bands to ease discharge pressure back into control range.

Adjustment

Both pressure thresholds can be shifted simultaneously over a 50psi (345kPa) range (the 35 psi [241 kPa] differential remains constant). The ball valve setpoint offset parameter in the Service menu can be adjusted from 0 to 50 psi (345 kPa) to raise or lower the control band similar to the pressure adjustment on a water regulating valve. Changing the setpoint offset will adjust the pressure thresholds for both circuits. Units are factory set at a 30 psi (207 kPa) setpoint offset (30 psi [207 kPa] above minimum). This results in a 220 psiA (1517 kPa) lower threshold and a 255 psiA (1758 kPa) upper threshold pressure.

Startup

The setpoint offset is adjusted to the minimum value during startup, then transitions to the set value once the compressor reaches normal operating pressures. Due to the control dead band it is possible for each circuit to stabilize at different pressures within the dead band. Additionally changes in fluid temperature could cause pressure changes that do not result in valve movement within the dead band. Fan cycling stats should be set to prevent continuous fluid temperature swings greater than 10^{o}F (5.6^{o}C) (see **10.15 - Drycooler Settings**).

Location

The motorized ball valves are located in the condenser fluid return line. Three-way valves are piped in a mixing arrangement with the common port at the valve outlet.

Manual Control

The valve can be manually set by disconnecting AC power, depressing the manual override button on the valve actuator, and adjusting the valve position with the handle. Motorized ball valves may be controlled through the Service menu using manual mode to override the normal control.

10.15 Drycooler Settings

Applications with the Optional Stat Setting require field piping to be insulated to prevent condensation. **Table 21** shows acceptable applications where stats must be adjusted to Optional Setting. Aquastats must be field-adjusted to Optional Setting for:

- GLYCOOL/Dual Cool applications
- Single Drycooler loops with motor ball valve flow controls.

Table 21 Water/glycol system conditions requiring optional settings for aquastats

Cooling Type	GLYCOOL		Glycol	
Flow Control	**MBV**		**MBV**	
Drycoolers in Loop	1	Multiple	1	Multiple
Stat Setting*	Optional	Optional	Optional	Factory
Insulate Field Piping	Yes	Yes	Yes	No

* See **Table 22**
MBV = motor ball valve; WRV = water regulating valve

Table 22 Aquastat settings—two-fan through four-fan drycoolers

Dial Setting (Stat Open Temp) Set for Mid Differential 8°F (4.4°C) Rise to Close			
Aquastat #	**Fans**	**Factory Setting (Glycol) (see Notes 1 and 2)**	**Optional Setting (GLYCOOL) (see Note 3)**
AQ1	F1	65°F (18.3°C)	35°F (1.7°C)
AQ2	F2 & F3	75°F (23.9°C)	45°F (7.2°C)
AQ3	F4	70°F (21.1°C)	40°F (4.4°C)

NOTE

1. *All drycoolers are shipped at Factory Setting.*
2. *Factory Setting is used for all glycol applications, except single drycooler loops with motor ball valve controls.*
3. *Stats must be field-adjusted to Optional Setting for GLYCOOL/Dual Cool applications and all single drycooler loops using motor ball valve flow controls.*

11.0 HVAC MAINTENANCE CHECKLIST

Source: DPN002952, Rev. 0

Inspection Date		Job Name	
Indoor Unit Model #		Indoor Unit Serial Number #	
Condenser/Drycooler Model #		Condenser/Drycooler Serial #	
Room Temperature/Humidity	° %	Ambient Temperature	°

Not all units will have all components. To determine your unit's configuration, compare the **Indoor Unit Model #** above and the information in **1.0 - Liebert PDX and Liebert PCW Components and Nomenclature**.

Filters

___ 1. Check/replace filters
___ 2. Grille area unrestricted
___ 3. Wipe section clean
___ 4. Coil clean

Blower Section

___ 1. Blower wheels free of debris
___ 2. Check motor mount
___ 3. Motor amp draw L1_____ L2 _____ L3_____
____Compare to nameplate amps

Reheat

___ 1. Inspect elements
___ 2. Check wire connections (inside reheat box)
___ 3. Reheat amp draw
___ a. #1
___ a. #2
___ a. #3

Steam Generating Humidifier

___ 1. Check drain valve/drain lines/trap for clogs
___ 2. Check water make-up valve and all hoses for leaks
___ 3. Clean the fill strainer
___ 4. Replace humidifier bottle if necessary
___ 5. Check operation of humidifier
___ 6. Humidifier amp draw L1 _____ L2 _____L3_____

Infrared Humidifier

___ 1. Check drain lines and trap for clogs
___ 2. Check/clean pan for mineral deposits
___ 3. Clean reflector
___ 4. Check water make-up valve for leaks
___ 5. Check humidifier lamps (replace if burnt out)
___ 6. Check wire connections (inside humidifier box)
___ 7. Humidifier amp draw L1 _____ L2 _____L3_____

Condensate Pump

___ 1. Check for debris in sump

___ 2. Check operation of float(s) (free movement)

Refrigeration Piping

___ 1. Check refrigerant lines (clamps secure/no rubbing/no leaks)

___ 2. Check for moisture (sight glass)

Water-Cooled Condensers

___ 1. Check water regulating valve operation

___ 2. Cap tubes (not rubbing)

___ 3. Check for water/glycol leaks

___ 4. Entering water temperature _____ °

___ 5. Leaving water

Drain Piping

___ 1. Check for free running drain system

___ 2. Clear out obstructions and material buildup on tubing walls

___ 3. Check for leaks, corrosion and damaged piping

___ 4. Check for tubing kinks or damage

Compressor Section

___ 1. Check oil level

___ 2. Check for oil leaks

___ 3. Check compressor mounts (springs/bushings)

___ 4. Cap tubes (not rubbing)

___ 5. Check wire connections (inside compressor box)

___ 6. Compressor operation (vibration/noise)

___ 7. Suction Pressure

___ 8. Discharge Pressure

___ 9. Superheat

___ 10. Low pressure switch cut out

___ 11. Low pressure cut in

___ 12. High pressure cut out

___ 13. Amp draw

Electrical Panel

___ 1. Check fuses

___ 2. Check contactors for pitting

___ 3. Check wire connections

Controls

___ 1. Check/Verify Control Operation (Sequence)

___ 2. Check humidifier high water alarm operation

___ 3. Check operation of the air safety switch

___ 4. Check setting/operation of the filter clog switch

___ 5. Check/test changeover device(s)

___ 6. Check/test water detection device(s)

Air-Cooled Condenser / Drycooler

___ 1. Coil surfaces and fans free of debris (clean, wash and straighten fins as needed)

___ 2. Fan motors securely mounted

___ 3. Check all piping and capillaries for vibration isolation; support and secure as necessary

___ 4. Check fuses

___ 5. Check contactors for pitting

___ 6. Check wire connections

___ 7. Fan speed control operation

___ 8. Check operational sequence/thermostat setpoints

___ 9. Check refrigerant/glycol lines for signs of leaks/repair leaks as found

___ 10. Check refrigerant level in each Liebert Lee-Temp™ receiver

___ 11. Glycol level

___ 12. Glycol solution_____ %

___ 13. Motor amp draw

#1	L1		L2		L3	
		(L1 and L2 on Fan Speed Control Motor)				
#2	L1		L2		L3	
#3	L1		L2		L3	
#4	L1		L2		L3	
#5	L1		L2		L3	
#6	L1		L2		L3	
#7	L1		L2		L3	
#8	L1		L2		L3	

Glycol Pump

___ 1. Check pump rotation

___ 2. Check for glycol leaks

___ 3. Pump pressures

#1	Suction		Discharge	
#2	Suction		Discharge	

___ 4. Amp Draw

#1	L1		L2		L3	
#2	L1		L2		L3	

___ 5. Pump changeover (if multiple pumps)

Maintenance Notes

Signature _____

Company _____

Make photocopies for your records. Compare readings / information to previous maintenance worksheet. To locate your local Emerson® representative for Liebert-engineered parts, check the Liebert Web site: **www.liebert.com** or call 1-800-LIEBERT.

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